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EVERETT

Project Name	Water Filtration Plant Air Scour Blower Building Replacement, City of Everett, WA #UP3813
Contractor Name	IMCO General Construction, Inc.
Bid Opening Date	7/16/2024 @ 2:00 pm PDT
City Clerk's Digital Certification Stamp	City of Everett Digitally signed by City of Everett Date: 2024.08.28 15:09:17 -07'00'

EVERETT
WASHINGTON

CITY OF EVERETT

SPECIFICATIONS, PROPOSAL, AND CONTRACT DOCUMENTS

FOR

WATER FILTRATION PLANT AIR SCOUR BLOWER BUILDING REPLACEMENT

WORK ORDER # UP 3813

Issued for Bid

June 2024

Prepared By: BHC Consultants

City of Everett Public Works
3200 Cedar Street
Everett, WA 98201

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CERTIFICATE PAGE

City of Everett

WFP Air Scour Blower Building Replacement

The engineering material and data contained in the Plans and Specifications were prepared under the supervision and direction of the undersigned, whose seal as a registered professional engineer is affixed below.

 06/03/2024	Specifications: Divisions 00, 01, and 31 John F. Gillespie III, P.E. BHC Consultants, LLC
 06/03/2024	Specifications: Division 26 and 28 Jeffrey S. Gibson, P.E. BHC Consultants, LLC
 06/03/2024	Specifications: Division 40 Cameron Robert Ochiltree, P.E. BHC Consultants, LLC

 06/03/2024	Specifications: Divisions 03, 08, 09, 11, and 13 Kenneth E. Dahl, P.E., S.E. BHC Consultants, LLC
 06/03/2024	Specifications: Division 23 Kevin Chadwick, P.E., LEED AP B+C FSi Engineers

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SECTION 00 11 13
ADVERTISEMENT FOR BIDS

Notice is hereby given that sealed bids/proposals for the **Water Filtration Plant Air Scour Blower Building Replacement Project** will be received at the City Clerk, 1st Floor Everett Municipal Building, 2930 Wetmore, Everett, WA, 98201, until 2:00 p.m. on **Tuesday, July 9, 2024**. At the appointed time, all bids/proposals will be opened and read aloud publicly via live streaming, or bidders may attend the bid opening in person at 2930 Wetmore Ave, Suite 9E, Everett, WA 98201. The link to view the live streaming bid opening can be found at: https://everettwa.gov/319/Procurement.

The engineer's estimate for this Project is **$998,000.00**, not including sales tax.

The City of Everett owns a Water Filtration Plant (WFP) located at 6133 Lake Chaplain Road, Monroe, WA 98272-7821 and is seeking a Contractor to construct and install the following, but not limited to:

1. Construct a pre-engineered metal building to house two (2) air blowers, an air compressor, dry-type transformer, control panel, two (2) variable frequency drives (VFDs), and a panelboard. The building interior size is approximately 24'x 30' with an 18' wide by 12' high rollup door and a single 36" door. An on-grade concrete foundation will support the building. The new building is approximately 5 feet from the existing blower building.
2. Install a new air blower and relocate the existing air blower from the current blower building to the new blower building. The blowers are variable speed units with 200 HP motors, and with a capacity of approximately 3,825 standard cubic feet per minute. The new blower has been sized and selected by the City. The new blower will be purchased by the City and will be delivered prior to construction for installation by the contractor. Connect the air blower piping from the blowers to the air piping outside the main WFP building.
3. Install a new duplex instrumentation-grade air compressor system to provide redundancy with the existing compressor unit located inside the main WFP building. This compressor system provides instrumentation-grade air for the pneumatic valve actuators used to regulate the filter plant operations. The compressor unit will be purchased by the City and will be delivered prior to construction for installation by the contractor. The compressor system package includes two (2) compressor units, air receiver, pressure regulator, compressor controls, filtration, drying system, and oil mist eliminator with a nominal rated output pressure of 125 psi. The new compressed air piping from the compressor connects with the existing piping inside the main WFP building.
4. Install a new motor control center (MCC) with a 480-volt panel and individually mounted VFDs.
5. Transfer the existing blower control panel from the current blower building to the new blower building.
6. Transfer the existing fiber optic termination cabinet from the current blower building to the new blower building and install new fiber optic cables.
7. Provide electrical service to the new building by connecting to an existing transformer near the building.
8. Provide ventilation for the new building.

9. Provide site improvements, such as drainage piping and crushed surfacing top course.

A pre-bid meeting will be held at the City of Everett's Water Filtration Plant located at 6133 Lake Chaplain Road, Monroe, WA 98272-7821 on June 24, 2024 at 10:00 a.m. to discuss the project. Attendance is voluntary for all prospective bidders. The meeting will also include a site walk.

Free-of-charge access to project bid documents (plans, specifications, addenda, and Bidders List) is provided to Prime Bidders, Subcontractors, and Vendors by going to www.bxwa.com and clicking on "Posted Projects", "Public Works", and "City of Everett". This online plan room provides Bidders with fully usable online documents with the ability to: download, view, print, order full/partial plan sets from numerous reprographic sources, and a free online digitizer/take-off tool. It is recommended that Bidders "Register" in order to receive automatic e-mail notification of future addenda and to place themselves on the "Self-Registered Bidders List". Bidders that do not register will not be automatically notified of addenda and will need to periodically check the on-line plan room for addenda issued on this project. Contact Builders Exchange of Washington at (425) 258-1303 should you require assistance with access or registration.

All bids/proposals must be made upon the City forms provided in the bidding documents and must be accompanied by a bid bond or certified check or cashier's check in an amount not less than five percent (5%) of the total amount of the bid/proposal, all in accordance with the bidding documents. A one hundred percent (100%) performance bond (and a one hundred percent (100%) payment bond, as may be required in the bidding documents), on form(s) provided by the City, will be required of the successful bidder to guarantee faithful performance of the contract.

The City reserves the right to reject any and all bids/proposals and to waive any irregularities or informalities. Except as may be provided in the Contract Documents, no Bidder may withdraw his Bid after the hour set for the opening thereof.

The City further reserves the right to make the bid award as deemed in the best interest of the City. The right is reserved by the City to postpone the award for a period of 45 days after bid opening.

The Contractor will be required to comply with all local, State, and Federal laws and regulations pertaining to equal employment opportunities.

The City, in accordance with Title VI of the Civil Rights Act of 1964, (78 Stat. 252, 42 U.S.C. 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that, in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

By order of the City Council, Everett, Washington.

END OF SECTION 00 11 13

SECTION 00 21 13
INSTRUCTIONS TO BIDDERS

1-00 INTRODUCTORY MATTERS

General Description and Location of Project

The Work to be performed will include furnishing all labor, materials and equipment necessary to perform all Work as required by the Contract in accordance with the Contract Documents.

The Project is located at 6133 Lake Chaplain Road, Monroe, WA 98272.

Project Manager

Questions and inquiries about these Contract Documents should be directed in writing to the attention of John Nottingham, PE, jnottingham@everettwa.gov.

Standard Specifications

The following other Specifications and Standard Plans shall apply **only to the extent** that they are called out in the Contract Documents.

- WSDOT "Standard Specifications for Road, Bridge and Municipal Construction", hereinafter referred to as the "Standard Specifications, latest edition."
- City of Everett "Design and Construction Standards and Specifications" (Revised January 2018), as found online on the City's Website at: https://everettwa.gov/1531/Design-Construction-Standards
- "Standard Plans for Road and Bridge Construction," latest edition as prepared by WSDOT.
- "Manual on Uniform Traffic Control Devices" (MUTCD), latest edition.
- APWA Standards, latest edition.
- AWWA Standards, latest edition.
- American Concrete Institute (ACI), latest edition.

1-01 DEFINITIONS AND TERMS

1-01.3 Definitions

Definitions are found in SECTION 00 72 00 - GENERAL CONDITIONS.

1-02 BID PROCEDURES AND CONDITIONS

1-02.1 Bidder Responsibility Criteria

1-02.1(1) Mandatory Bidder Responsibility Criteria

Bidder shall meet mandatory responsibility criteria in accordance with RCW 39.04.350(1). The City may require Bidder to submit documentation demonstrating compliance with the criteria under this 1-02.1(1). Bidder must:

1. Registration. At the time of bid submittal, have a certificate of registration in compliance with chapter 18.27 RCW, a plumbing contractor license in compliance

with chapter 18.106 RCW, an elevator contractor license in compliance with chapter 70.87 RCW, or an electrical contractor license in compliance with chapter 19.28 RCW, as required under the provisions of those chapters; and

2. UBI. Have a current Washington Unified Business Identifier (UBI) number; and
3. State Requirements. If applicable:
    a. Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
    b. Have a Washington Employment Security Department number, as required in Title 50 RCW; and
    c. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW.
4. Disqualification. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3).
5. Prevailing Wage Training. Unless Bidder has completed three or more public works projects and had a valid business license for three or more years, Bidder must have received Department of Labor and Industries training on the requirements related to public works and prevailing wage under RCW 39.12 and RCW 39.04.
5. Certification of Wage Compliance. Within the three-year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the department of labor and industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW.
6. Apprentices. If the Project is subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the bid solicitation.

1-02.1(2) Supplemental Bidder Responsibility Criteria

If this Project is subject to supplemental bidder responsibility criteria, then such criteria will be contained in SECTION 00 22 13 - SUPPLEMENTAL INSTRUCTIONS TO BIDDERS. If there is no SECTION 00 22 13 - SUPPLEMENTAL INSTRUCTIONS TO BIDDERS in the bid package, then the Project is not subject to supplemental bidder responsibility criteria.

1-02.2 Plans and Specifications

Information as to where bid documents can be obtained or reviewed will be found in the Call for Bids (Advertisement for Bids) for the Work.

1-02.3 Not Used

1-02.4 Examination of Plans, Specifications, and Site of Work

1-02.4(1) General

The Bidder shall carefully examine the Contract Documents. Submittal of a Bid shall be conclusive evidence that the Bidder has made these examinations and understands all requirements for the performance of the completed Work. The Bidder further warrants, agrees, and acknowledges by submitting a Bid that it:

1. Has taken steps reasonably necessary to ascertain the nature and location of the Work, including without limitation the actual physical conditions of and at the location, surface and subsurface conditions, and conditions ordinarily to be encountered and generally recognized as inherent in the Work;
2. Has investigated and satisfied itself as to the general and local conditions which can affect the Work or its cost, including but not limited to:
    a. Conditions bearing upon acquisition, transportation, disposal, handling, and storage of materials;
    b. The availability of labor, materials, services, utilities (including without limitation water and electric power), and roads;
    c. Uncertainties of weather, river stages, tides, or similar physical conditions at the site;
    d. The conformation and condition of the ground;
    e. The character of equipment and facilities needed preliminary to and during Work performance;
    f. The site biological hazards and associated physical hazards;
    g. Access to the Site;
    h. Environmental factors; and
    i. All other data, matters and things requisite to the fulfillment of the Work.
3. Has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the Work site (including material sites) as well as from the bid documents and other information made a part of this Contract, and, if physical testing by Bidder of the Site is permitted by the City, Bidder has completed such testing to its satisfaction; and
4. Has satisfied itself as to the adequacy of time allowed for the completion of the physical Work on the Contract.

Any failure of the Bidder to take the actions described and acknowledged in this clause shall not relieve the Bidder from responsibility for estimating properly the difficulty and cost of successfully performing the Work, or from proceeding to successfully perform the Work without additional expense to the City.

The Bidder agrees that the City shall not be liable to it on any claim for additional payment or additional time or any claim whatsoever if the claim directly or indirectly results from the Bidder's failure to investigate and familiarize itself sufficiently with the conditions under which the Contract is to be performed.

The Bidder shall be familiar and comply with all Federal, State, tribal, and local laws, ordinances, and regulations which might affect those engaged in the Work. The City will not consider any plea of misunderstanding or ignorance of such requirements.

Bid prices shall include everything necessary for the completion of the Work including, but not limited to, providing the materials, equipment, tools, plant and other facilities, and the management, superintendence, labor, and all necessary testing services.

Prospective Bidders are advised that projects with Work on or adjacent to water may require insurance coverage in compliance with:

1. The Longshoremen's and Harbor Worker's Compensation Act (administered by U.S. Department of Labor), or
2. The State Industrial Insurance (administrated by the Washington State Department of Labor and Industries), or
3. Both.

The Contractor shall bear all cost for such insurance as provided in the Contract Documents.

No Claim shall be allowed because of any ambiguity in the Contract if:

1. The Bidder discovers an ambiguity but fails to notify the City, or
2. The Bidder failed to discover a patent ambiguity that would be discovered by a reasonably prudent contractor in preparing its Bid.

Any prospective Bidder desiring an explanation or interpretation of the Bid Documents, shall request the explanation or interpretation in writing by close of business seven business days preceding the Bid opening to allow a written reply to reach all prospective Bidders before the submission of their Bids.

Bidder acknowledges that the Bidder has not relied on representation or warranty of the City not expressly included in the Contract Documents.

The information provided by the City is not intended to be a substitute for, or a supplement to, the independent verification by the Bidder to the extent such independent investigation of the Drawings and Specifications or Site conditions is deemed necessary or desirable by the Bidder. Bidder acknowledges that they have not relied upon City or Engineer furnished information regarding site conditions in preparing and submitting a Bid.

1-02.4(1)A Interpretation of Contract Documents

Should a Bidder find what is believed to be discrepancies in or omissions from the Plans, Specifications, or any other Contract Document, or should the Bidder be in doubt as to their meaning, Bidder may submit to the City a written request for an interpretation thereof. The Bidder submitting the request will be responsible for its prompt delivery. Any interpretation of the documents, if made, will be made only by addendum duly issued. **All requests for interpretations must be received by the City or Engineer no later than 7 calendar days prior to the bid opening date**. All questions regarding the Contract Documents shall be referred to the City at the address provided in the Contract Documents.

1-02.4(1)B Prevailing Wages

Bidder is directed to the Contract Documents for requirements regarding applying payment of prevailing wage rates for employment of labor on within Snohomish County.

All laborers, workmen, or mechanics in each trade or occupation employed in the performance of the Contract either by Contractor, Subcontractor, or other person doing Work shall be paid not less than the prevailing rate of wage as defined in RCW 39.12.010. Current prevailing wage rates may be found online at https://www.lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates.

The rules and regulations noted within the Contract Documents are available from:

State of Washington Department of Labor and Industries
Prevailing Wage Section
PO Box 44540
Olympia, WA 98504-4540
(360) 902-5335
pw1@lni.wa.gov

Bidders are advised to examine and to be thoroughly familiar with such requirements. No claim for additional compensation will be allowed that is based upon a lack of knowledge of these requirements or a failure to include adequate increases in such wages over the term of this Contract in the Bidder's Bid.

1-02.4(1)C Apprentice Utilization

If this Project is subject to apprentice utilization requirements, then such requirements will be contained in SECTION 00 73 73 - APPRENTICE UTILIZATION. If there is no SECTION 00 73 73 - APPRENTICE UTILIZATION in the bid package, then the Project is not subject to apprentice utilization requirements. Bidders are advised to examine and to be thoroughly familiar with such requirements. No claim for additional compensation will be allowed that is based upon a lack of knowledge of these requirements.

1-02.4(2) Subsurface Information

A site specific geotechnical investigation was not conducted but the City has made previous subsurface investigations for other projects within the Water Filtration Plant (WFP) property. The geotechnical data accumulated by the City will be made available for inspection by the Bidders. The geotechnical data shall NOT be considered as part of the Contract. In addition, the City makes no representation or warranty expressed or implied that:

1. The Bidders' interpretations from the boring logs are correct,
2. Moisture conditions and indicated water tables will not vary from those found at the time the borings were made, and
3. The ground at the location of the borings has not been physically disturbed or altered after the boring was made.

The City specifically makes no representations, guarantees, or warranties as to the condition, materials, or proportions of the materials between the specific borings regardless of any subsurface information the City may make available to the prospective Bidders.

The boring log data and soil sample data, if any, are included in the bid documents.

If there is a geotechnical report made by the City, Bidder may contact the Project Manager to arrange to view the geotechnical report.

1-02.5 Bid Form

The City reserves the right to arrange the bid forms with alternates and additives, if such be to the advantage of the City. The Bidder shall bid on all alternates and additives set forth in the Bid Form unless otherwise specified.

1-02.6 Preparation of Bid

Bids shall be submitted on the forms provided by the City and found in the Contract Documents. All blank spaces in the Bid form shall be legibly filled in using a non-erasable medium. Do not qualify Bids, since this will automatically be cause for rejection of the Bid.

A Bid will be rejected if the authorized Bid form furnished by the City is not used.

Bid prices shall include everything necessary for the completion of the Work including, but not limited to, providing the materials, equipment, tools, plant and other facilities, and the management, superintendence, labor, and all necessary testing services.

Bidders are warned against making erasures or alterations of any kind to the Bid Form, and bids that contain omissions, erasures, or irregularities of any kind may be rejected. No oral, telegraphic, electronic, or telephonic bids or modifications will be considered.

In the event that the product of a unit price and an estimated quantity does not equal the extended amount quoted, the unit price shall govern, and the correct product of the unit price and the estimated quantity shall be deemed to be the amount bid. If the sum of two or more items in a bidding schedule does not equal the total amounts quoted, the individual item amounts shall govern and the correct total shall be deemed to be the amount bid.

RCW 35.22.650 CERTIFICATION

Contractor agrees that the Contractor shall actively solicit the employment of minority group members. Contractor further agrees that the Contractor shall actively solicit Bids for the subcontracting of goods or services from qualified minority businesses. Contractor shall furnish evidence of the Contractor's compliance with these requirements of minority employment and solicitation. Contractor further agrees to consider the grant of subcontracts to said minority bidders on the basis of substantially equal proposals in the light most favorable to said minority businesses. The Contractor is required to submit evidence of compliance with this section as part of the Bid by completing and submitting with the Bid the RCW 35.22.650 CERTIFICATION.

PROPOSED SUBCONTRACTORS FORM

Bidder shall complete SECTION 00 43 36 – PROPOSED SUBCONTRACTORS FORM and submit it with the Bid.

NONCOLLUSION AFFIDAVIT

The City has determined every Bidder must submit a Non-Collusion Affidavit for every Project. Accordingly, the Bidder shall submit a “Non-Collusion Affidavit”, contained in the Contract Documents as SECTION 00 45 19 - NONCOLLUSION AFFIDAVIT, with the Bid. If the City has

reason to believe that collusion exists among Bidders, the City will reject the Bids of the known participants in such collusion and may, at its option, require that all Bidders certify under penalty of perjury, that no collusion has occurred or exists.

1-02.7 Bid Security

Bid Security in the amount of at least 5 percent of the Total Bid shall accompany each Bid. This security may be by certified check, cashier's check, or a bid bond made payable to the City of Everett. A bid bond shall be on the form provided in the Contract Documents. A bid bond shall not be conditioned to modify the minimum 5-percent required. The surety shall: (1) be registered with the Washington State Insurance Commissioner, and (2) appear on the current Authorized Insurance List in the State of Washington published by the Office of the Insurance Commissioner.

The failure to furnish a bid security of a minimum of 5 percent shall make the Bid nonresponsive and shall cause the Bid to be rejected by the City of Everett.

Bid security shall serve as evidence of good faith and as a guarantee that if awarded the Contract the Bidder will execute the Contract and provide bonds as required by the Bid. Should the successful Bidder fail to enter into the Contract, furnish a satisfactory performance and payment bond, and furnish evidence of insurance within 14 calendar days after the award date unless such date is extended by the City, the certified check, cashier's check or bid bond shall be forfeited as liquidated damages.

1-02.8 Not Used.

1-02.9 Delivery of Bid

Bidder shall submit Bidder's Bid in a sealed opaque envelope that clearly and legibly notes the Project Name, the time and date of the bid opening, and the Bidder's name and address on the outside of the envelope.

The City will not open or consider any Bid or any supplement to a Bid that is received after the time specified for receipt of Bids, or received in a location other than that specified for receipt of Bids.

1-02.10 Withdrawing, Revising, or Supplementing Bid

After submitting a physical Bid Form to the City, the Bidder may withdraw, revise, or supplement it if:

1. The Bidder submits a written request signed by an authorized person and physically delivers it to the place designated for receipt of Bids, and
2. The City receives the request before the time set for receipt of Bids, and
3. The revised or supplemented Bid (if any) is received by the City before the time set for receipt of the Bid.

The original physical Bid Form may be supplemented, or revised and resubmitted as the official Bid if the City receives it before the time set for receipt of Bids.

Email, fax or telephone requests to withdraw, revise, or supplement a Bid are not acceptable.

Resubmitted Bids shall be in full compliance with the bidding requirements. Bid deposit shall be in an amount sufficient for the Bid as resubmitted.

After the scheduled time for opening Bids, no Bidder will be permitted to withdraw its Bid unless the award of contract is delayed for a period exceeding 45 calendar days. Proposals received after the scheduled closing for opening Proposals will be returned unopened to the Bidder.

1-02.11 Not Used

1-02.12 Public Opening of Proposals

1-02.12(1) Postponement of Opening

Proposals will be opened and publicly read at the time indicated in the call for Bids unless the Bid opening has been delayed or canceled. Bidders, their authorized agents, and other interested parties are invited to be present.

If an emergency or unanticipated event interrupts normal work processes of the City so that Bids cannot be opened at the time indicated in the call for Bids the time specified for opening of Bids will be deemed to be extended to the same time of day on the first work day on which the normal work processes of the City resume.

The City reserves the right to postpone the date and time for receiving or opening of Bids, or both, at any time prior to the date and time established in the Notice to Bidders. Postponement notices shall be provided to Bidders in the form of addenda.

1-02.12(2) Video Conferencing

The City reserves the right to open and publicly read Bids by use of video-conferencing, such as by Microsoft Teams, Zoom or other application.

1-02.13 Irregular Bids

1. A Proposal will be considered irregular and will be rejected if:
    a. The authorized bid form furnished by the City is not used or is altered;
    b. The completed bid form contains any unauthorized additions, deletions, alternate Bids, or conditions;
    c. The Bidder adds provisions reserving the right to reject or accept the Award, or enter into the Contract;
    d. A price per unit cannot be determined from the Bid Form;
    e. The Bid Form is not properly executed;
    f. The Bidder fails to submit or properly complete on the form provided by the City a Subcontractor list, if applicable, as required in these Instructions;
    g. The Bidder fails to submit or properly complete a RCW 35.22.650 Certification, as required in these Instructions;
    h. The Bidder fails to submit or properly complete a Non-Collusion Affidavit, as required in these Instructions;

i. The Bid Form does not constitute a definite and unqualified offer to meet the material terms of the Bid invitation; or

j. More than one proposal is submitted for the same project from a Bidder under the same or different names.

2. A Proposal may be considered irregular and may be rejected if:

a. If the Bid Form includes unit prices, the Bidder's Bid Form does not include a unit price for every Bid item;

b. If the Bid Form includes unit prices, any of the Bidder's unit prices are excessively unbalanced (either above or below the amount of a reasonable Bid) to the potential detriment of the City, as determined by the City;

c. Receipt of Addenda is not acknowledged;

d. A member of a joint venture or partnership and the joint venture or partnership submit Proposals for the same project (in such an instance, both Bids may be rejected); or

e. If Bid Form entries are not made in ink.

1-02.14 Disqualification of Bidders

A Bidder will be deemed not responsible if the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1), as amended, and noted in 1-02.1(1).

The City will verify that the Bidder meets the mandatory bidder responsibility criteria in RCW 39.04.350(1). To assess bidder responsibility, the City reserves the right to request documentation as needed from the Bidder and third parties concerning the Bidder's compliance with the mandatory bidder responsibility criteria.

If the City determines the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1) and is therefore not a responsible Bidder, the City shall notify the Bidder in writing, with the reasons for its determination. If the Bidder disagrees with this determination, it may appeal the determination within two business days of the City's determination by presenting its appeal and any additional information to the City. The City will consider the appeal and any additional information before issuing its final determination. If the final determination affirms that the Bidder is not responsible, the City will not execute a contract with any other Bidder until at least two business days after the Bidder determined to be not responsible has received the City's final determination.

If the Contract Documents contain supplemental responsibility criteria, then a Bidder will be deemed not responsible if the Bidder does not meet those criteria, all as set forth in SECTION 00 22 13 - SUPPLEMENTAL INSTRUCTIONS TO BIDDERS.

1-02.15 Pre-Award Information

Before awarding any contract, the City may require one or more of these items or actions of the apparent lowest responsible Bidder:

1. A complete statement of the origin, composition, and manufacture of any or all materials to be used,

2. Samples of these materials for quality and fitness tests,

3. A progress schedule, in a form the City requires, showing the order of and time required for the various phases of the Work,
4. A breakdown of costs assigned to any bid item,
5. Attendance at a conference with the Engineer or representatives of the Engineer,
6. Obtain, and furnish a copy of, a business license to do business in the City of Everett.
7. A copy of State of Washington Contractor's Registration, or
8. Any other information or action taken that is deemed necessary to ensure that the Bidder is the lowest responsible bidder.

After Bid opening, but prior to award, the apparent successful Bidder shall, if requested by the City, attend a pre-award conference to respond to questions by the City regarding evaluation of Bids. The City will emphasize items such as insurance and bonding that will assist in prompt issuance of the Notice to Proceed. By conducting a pre-award conference, the City has not thereby waived its right to make determinations regarding responsiveness and responsibility of the Bidder.

1-03 AWARD AND EXECUTION OF CONTRACT

1-03.1 Consideration of Bids

Bids will be evaluated by the City to determine which bid is the lowest responsive bid by a responsible bidder and which bid, if any, should be accepted in the best interest of the City. The right is reserved by the City to waive informalities in the bidding, accept a Bid of the lowest responsible Bidder, reject any or all Bids, republish the call for Bids, revise or cancel the Work, or require the Work to be done in another way if the best interest of the City is served.

Within 5 days after the opening of Bids (or such longer time as the City may grant in writing), a Bidder who wishes to claim error shall submit a notarized affidavit signed by the Bidder, accompanied by original work sheets used in the preparation of the Bid, requesting relief from the responsibilities of Award. The affidavit shall describe the specific error(s) and certify that the work sheets are the originals used in the preparation of the Bid. The Engineer will review the certified work sheets to determine the validity of the claimed error and make recommendation to the City. If the City concurs in the claim of error, the Bidder will be relieved of responsibility, and the bid deposit of the Bidder will be returned. Thereafter, at the discretion of the City, all Bids may be rejected or Award made to next lowest and responsive Bidder.

1-03.1(2) Preference for Resident Contractors

In accordance with RCW 39.04.380, if a Bid is received from a nonresident contractor from a state that provides a percentage bidding preference and does not have an office located in Washington, then a comparable percentage disadvantage will be applied to the Bid of that nonresident contractor.

1-03.1(3) Tie Bids

After opening Bids, if two or more lowest responsive and responsible Bid totals are exactly equal, then the tie-breaker will be determined by drawing as described in this section. Two or more slips of paper will be marked as follows: one marked "Winner" and the other(s) marked "unsuccessful". The slips will be folded to make the marking unseen. The slips will be placed inside a box. One authorized representative of each Bidder shall draw a slip from

the box. Bidders shall draw in alphabetic order by the name of the firm as registered with the Washington State Department of Licensing. The slips shall be unfolded and the firm with the slip marked "Winner" will be determined to be the successful Bidder and eligible for Award of the Contract. Only those Bidders who submitted a Bid total that is exactly equal to the lowest responsive Bid are eligible to draw.

1-03.2 Award of Contract

Within 45 days after the opening of Bids, the City will act either to accept the Bid from the lowest responsive, responsible Bidder, or to reject all Bids. The City reserves the right to request extensions of such Bid acceptance period. If the lowest responsible Bidder and the City cannot agree on an extension by the 45 day deadline, the City reserves the right to award the Contract to the next lowest responsible Bidder or reject all Bids.

The acceptance of a Bid will be evidenced by a written Notice of Award of Contract delivered in person or by email or by certified mail to the Bidder whose Bid is accepted, together with a request to furnish a Contract Bond and evidence of insurance and to execute the Contract set forth in the Contract Documents. No Contract is formed until the Contract Execution Date.

1-03.3 Execution of Contract

Within 3 calendar days of receiving Notice of Award (not including Saturdays, Sundays and Holidays), the successful Bidder shall provide to the City the information necessary to execute the Contract electronically. This information shall include contact information, including the full name, title, email address, and phone number, for the authorized signer of the Bidder.

Successful Bidder has 14 calendar days after receiving the Notice of Award to complete the following:

- Execute the Contract upon receipt from the City's AdobeSign System.
- Submit to the City two (2) original paper payment bonds and two (2) original paper performance bonds submitted on forms contained in Contract Documents and fully executed, with proper power of attorney document(s).
- Submit to the City in pdf format certificate of insurance and additional insured endorsements in accordance with the Contract Documents.

Until the City executes a Contract, no Bid shall bind the City nor shall any Work begin within the project limits or within City-furnished sites. The Bidder shall bear all risks for any Work begun outside such areas and for any materials ordered before the Contract is executed by the City.

If the Bidder experiences circumstances beyond its control that prevents return of the Contract, bonds, and insurance documents within 14-calendar days after receiving Notice of Award, the City may grant more time, provided the City deems the circumstances warrant it.

A Contract shall not be formed until the Contract is signed by the Mayor.

1-03.4 Contract Bonds

The Contractor shall provide a separate payment bond and performance bond, each in the amount of 100 percent of the Contract Sum and each in the form contained in the Contract Documents. The bonds must be accompanied by a fully executed and original power of attorney for the officer executing on behalf of the surety.

1-03.5 Failure to Execute Contract

Failure to return the proof of insurance and the bonds with the signed Contract as required in these Instructions, or failure or refusal to sign the Contract, or failure to register as a contractor in the state of Washington shall result in forfeiture of the bid bond or deposit of this Bidder. If this should occur, the City may then Award the Contract to the second lowest responsible Bidder or reject all remaining Bids. If the second lowest responsible Bidder fails to return the required documents as stated above within the time provided after Award, the Contract may then be Awarded successively in a like manner to the remaining lowest responsible Bidders until the above requirements are met or the remaining Bid are rejected.

In addition, failure to have or obtain a City of Everett business license prior to executing the Contract, unless immediately cured by Bidder after notice from the City, shall result in forfeiture of the proposal bond or deposit of this Bidder.

1-03.6 Return of Bid Deposit

When Bids have been examined and corrected as necessary, proposal bonds and deposits accompanying Bids ineligible for further consideration will be returned. All other proposal bonds and deposits will be held until the Contract has been properly executed. When the Contract has been properly executed, all remaining deposits or bonds, except those subject to forfeiture, will be returned.

Within 15 calendar days after the Bids are opened, the City will return the bid deposit accompanying the Bids that are not to be considered in making the Award.

1-03.7 Judicial Review

All protests by Bidders must be in accordance with Chapter 3.46 of the Everett Municipal Code, “Bid Protest Procedures.”

The exclusive venue of all lawsuits shall be in Snohomish County Superior Court.

OTHER MATTERS

Time of Completion

The Contractor shall complete the Work on or before the date or dates specified in Section 00 52 13 - CONTRACT FORM

Equal Employment Opportunity

The Contractor will be required to assure that equal employment opportunities will be in effect to all individuals throughout the duration of this Contract, pursuant to SECTION 00 72 00, Part 7 “Labor Standards,” of the Contract Documents. The Contractor must comply with all local, State and Federal laws pertaining to non-discrimination and equal employment opportunity.

Sales Tax

The Washington State Department of Revenue has issued special rules on the State sales tax. The Contractor should contact the Washington State Department of Revenue for answers to questions in this area. The City will not adjust its payment if the Contractor bases a Bid on a misunderstood tax liability. The Contractor shall not include State retail sales

taxes in the unit bid prices. A separate line item for applying State retail sales tax is provided in the Bid Form.

Limitations Regarding Contractor's Claim for Damages

Bidders should review the Contract Documents regarding limitations on claims for damages.

Delays and Interference

Bidders should review the Contract Documents regarding delays and interference.

Business License

A City of Everett business license is required for the Contractor and Subcontractors performing Work on this Project.

BIDDER'S CHECKLIST

Forms for Submission with the Bid

The Bidder's attention is especially called to the following forms that must be executed in full as required and submitted with the Bid.

1. Bid Form: Show the lump sum and unit price items in the spaces provided on the Bid Form. To be filled in and signed by the Bidder.
2. Subcontractors Form: To be filled in by the Bidder, if required by these Instructions.
3. Bid Security: This form is to be executed by the Bidder and the surety company unless Bid is accompanied by a certified or cashier's check, as required by these instructions. The amount of the bond or cashier's check, which shall be not less than five percent of the Total Bid Amount, may be shown in dollars or on a percentage basis.
4. RCW 35.22.650 Certification: To be filled in and signed by the Bidder.
5. Non-Collusion Affidavit: To be signed, notarized and submitted with the Bid.

Failure to complete and fully execute the aforementioned forms and to submit them with the Bid may result in rejection of Bid.

Forms for Submission after Award of Contract

The following forms are to be executed after the award of Contract:

1. Contract: This Contract to be executed by the successful Bidder with the City's AdobeSign system within 14 calendar days after the award date.
2. Payment and Performance Bonds: These forms are to be executed by the successful Bidder and the Bidder's surety company. The amount of these bonds shall be 100 percent of the Total Bid and shall be submitted with the Contract.
3. Proof of Insurance: Insurance certificates and endorsements shall be obtained and maintained in force in accordance with SECTION 00 72 00, Part 15 "Liability and Insurance", of the Contract Documents.
4. Power of Attorney: Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their Power of Attorney.

5. Statement of Intent to Pay Prevailing Wage (L&I Form F700-029-000) and Affidavit of Wages Paid (F700-007-000) from the Contractor, Subcontractor and agents to the Subcontractor shall be submitted to the Employment Standards Division, State Department of Labor and Industries, Olympia, Washington. If the prime contract is over $1,000,000, then Contractor also needs to submit L&I Form F700-164-000 (Affidavit of Wages Paid EHB 2805 Addendum).
6. Weekly Statement with Respect to Payment of Wages (U.S. Dept of Labor Form WH347): Contractors, Subcontractors, and agents to Subcontractors using Payroll Form WH347 may use State of Compliance found on the back of the form.
7. Weekly Statement of Compliance (U.S. Dept of Labor Form WH348): Contractors, Subcontractors, or agents to Subcontractors not using Payroll Form WH347 shall attach the Statement of Compliance Form WH348 to each payroll.
8. Approval of Subcontractors: Contractors shall request approval of Subcontractors on a form provided by the City prior to their working on the Site.
9. Construction Progress Schedule: To be submitted as required by Section 00 72 00, Part 5 “Progress and Completion”, of the Contract Documents by the Contractor within ten calendar days, or such time as determined by the City, after the date of receipt of Notice to Proceed.
10. Traffic Control Plan: Standard Traffic Control Plans are included in the City’s Design and Construction Standards. If, and to the extent, such plans are not sufficient, complete or adequate to support the Bidder’s planned means and methods of performing the Work, the Bidder must develop an adequate, complete and sufficient traffic control plan at its cost, that shall be submitted for the City’s approval prior to construction. Deviation from the Standard Plans must be submitted by the Contractor and approved by the City prior to construction.
11. Disposal Sites: Provide the City with the location of all disposal sites to be used, and also provide copies of the permits and approvals for such disposal sites. The Contractor shall provide the City with copies of all permits for disposal and storage of surplus materials within ten calendar days after award of the Contract.

END OF SECTION 00 21 13

SECTION 00 22 13
SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

PART 1 : GENERAL

1.01 GENERAL

A. It is the intent of City to award a contract to the lowest responsive and responsible Bidder. Before award, the Bidder must also meet the supplemental bidder responsibility criteria listed below. Further, the apparent low Bidder and second apparent low bidder must submit the Bidder Qualification Statement (Section 00 45 13) and any other documentation listed below to the City within one business day after the bid opening, unless the City's project manager, in writing, allows additional time. The City reserves the right to require such documentation from other bidders also.

1.02 SUPPLEMENTAL RESPONSIBILITY CRITERIA

A. Experience:

1. Criteria:
    a. The Bidder must have successfully completed at least three (3) Similar Projects within the ten (10) years prior to bid opening.
    b. The Bidder's project manager for the Project must have successfully supervised to completion at least three (3) Similar Projects within the ten (10) years prior to bid opening.
    c. The Bidder's superintendent for the Project must have successfully supervised to completion at least three (3) Similar Projects within the ten (10) years prior to bid opening.
    d. The Bidder's principal foreman for the Project must have successfully supervised to completion at least three (3) Similar Projects within the ten (10) years prior to bid opening.
2. Definition of Similar Project:
    a. A "Similar Project" means a project that meets all of the following requirements:
        1) Awarded total contract value of at least $1,000,000.
        2) Work involving the construction of large-scale infrastructure components similar to the WFP Air Scour Blower Building Replacement Project.
3. Documentation: The Bidder shall submit the Bidder Qualification Statement as provided in Section 00 45 13. The City may also use independent sources of information that may be available to demonstrate whether the Bidder is in compliance with these criteria.

4. Evaluation: In evaluating whether these criteria are met, the City may check references for the previous projects and may evaluate the project owner's assessment of the Bidder's performance, including but not limited to the following areas:

   a. Quality control;

   b. Safety record;

   c. Timeliness of performance;

   d. Use of skilled personnel;

   e. Management of subcontractors;

   f. Availability of and use of appropriate equipment;

   g. Compliance with contract documents;

   h. Management of submittals process, change orders, and close-out.

1.03 PROCEDURE

A. Requests for Criteria Modification:

1. A Bidder may request that City modify the supplemental bidder responsibility criteria listed above. This request must be in writing to the City project manager and must be received by the City project manager at least ten (10) business days before the bid opening. The City project manager will evaluate the information submitted by the Bidder and will respond within three (3) business days after receipt of the request. If City evaluation results in a change of the criteria, the City will issue an addendum to the bid documents identifying the new or revised criteria. Any protest of a City decision regarding a request for criteria modification must be in strict conformity with Everett Municipal Code Chapter 3.46, Bid Protest Procedures.

B. Additional Information:

1. The City may require that the Bidder submit information in addition to the Bidder's Supplemental Responsibility Statement. The City may require supplementation or revision of the Bidder's Supplemental Responsibility Statement. The City also reserves the right to obtain information from third parties and independent sources of information concerning a Bidder's compliance with the mandatory and supplemental criteria, and to use that information in their evaluation. The City may consider mitigating factors in determining whether the Bidder complies with the requirements of the Supplemental Criteria.

C. Appeal of Responsibility Decision:

1. If the City determines the Bidder does not meet the bidder responsibility criteria above and is therefore not a responsible bidder, the City will notify the Bidder in writing with the reasons for its determination. If the Bidder disagrees with this determination, the Bidder may appeal to the director of the City department responsible for this Contract (the "Director") by presenting additional information to the Director in writing within two (2) business days after receipt of the City's determination. The Director will

consider the appeal and any additional information and will issue a decision regarding the appeal. Any protest by Bidder of the Director decision must be in strict conformity to Everett Municipal Code Chapter 3.46, Bid Protest Procedures, which (among other requirements) requires that any protest be filed with the City Clerk no later than the business day prior to the date of City Council proposed award or rejection of all bids. The City will not execute a contract with any other Bidder until two (2) business days after the Bidder determined to be not responsible has received the Director decision or, if a protest is filed under Everett Municipal Code Chapter 3.46, until two (2) business days after the Bidder receives written notice of the City's final determination of the protest.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 00 22 13

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SECTION 00 41 13
BID FORM

PART 1 : GENERAL

1.01 BIDDER INFORMATION

A. Project Title: WFP Air Scour Blower Building Replacement

B. Project No.: UP3813

C. Date: _____

D. Submitted by: _____

E. Company Name and Address:
_____
_____
_____.

1.02 OFFER

A. Having examined the place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by the Owner for the above-referenced Project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the prices listed in this Bid Form.

B. We have included the Bid security as required by the Instructions to Bidders.

1. All applicable federal taxes are included, and State of Washington taxes are excluded from the Unit Prices.
2. Our bid includes overhead, profit, performance and payment bonds, and all other expenses involved whatsoever.

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	CONTRACT PRICE
1.	Mobilization	LS	1	$_____.__	$_____.__
2.	SPCC Plan	LS	1	$_____.__	$_____.__
3.	Temporary Erosion and Sediment Control	FA	1	$3,000.00	$3,000.00
4.	Trench Excavation Safety Systems	LS	1	$_____.__	$_____.__
5.	Resolution of Utility Conflicts	FA	1	$7,000.00	$7,000.00
6.	Blower Building Structure	LS	1	$_____.__	$_____.__
7.	Centrifugal Blower Installation	LS	1	$_____.__	$_____.__
8.	Duplex Air Compressor Installation	LS	1	$_____.__	$_____.__
9.	Mechanical Piping, Valves, and Appurtenances	LS	1	$_____.__	$_____.__
10.	Building HVAC	LS	1	$_____.__	$_____.__
11.	Drain Piping	LS	1	$_____.__	$_____.__
12.	Crushed Surfacing Top and Base Course	TN	50	$_____.__	$_____.__
13.	Electrical and Controls	LS	1	$_____.__	$_____.__
14.	Startup and Testing	LS	1	$_____.__	$_____.__
15.	Final Restoration and Cleanup	LS	1	$_____.__	$_____.__
16.	Minor Changes	FA	1	$20,000.00	$20,000.00
17.	Record Drawings	LS	1	$8,000.00	$8,000.00
				SUBTOTAL	$_____.__
				Washington State Sales Tax @ 8.5%	$_____.__
				TOTAL BID	**$_____.__**

1.03 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for 45 days from the Bid closing date.

B. If this Bid is accepted by the Owner within the time period stated above, we will:

1. Execute the Agreement within 14 days of receipt of Notice of Award.
2. Furnish the required 100% payment and 100% performance bonds within 14 calendar days of receipt of Notice of Award in the form described in Contract Documents.
3. Submit to the City in pdf format within 14 calendar days of receipt of Notice of Award the certificate of insurance and additional insured endorsements in accordance with the Contract Documents.
4. Commence Work within seven calendar days after receipt of Notice to Proceed.

C. If this Bid is accepted within the indicated time, and we fail to commence the Work or we fail to provide the required bonds, the Bid security shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the Bid security or the difference between this Bid and the Bid upon which Contract is signed.

D. In the event our Bid is not accepted within the time stated above, the required Bid security will be returned to the undersigned, according to the provisions of the Instructions to Bidders, unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.04 CONTRACT TIME

A. If this Bid is accepted, we will:

1. Begin work immediately after receiving Owner's letter of Notice to Proceed and to reach Substantial Completion within the dates required under the Contract Documents.
2. Agree to pay liquidated damages to the City as stated in the Contract in the event the project is not completed on or before required time periods.
3. Contract with the Owner using the Contract form provided herewith, on the terms and conditions contained herein, to do everything necessary to complete the construction of the project in the allotted time.

1.05 ADDENDA

A. Following Addenda have been received, and the modifications to the Bid Documents noted below have been considered and all costs are included in the Bid.

Addendum No……., dated ……..

Addendum No……., dated ……..

Addendum No……., dated ……..

Addendum No……., dated ……..

1.06 BIDDER CERTIFICATIONS

A. Bidder, at the time of submitting this Bid and throughout the period of the contract, will remain licensed by the state of Washington to perform the type of work required under the Contract Documents.

B. Bidder is skilled and regularly engaged in the general class and type of work required by the Contract Documents and has the capability to successfully manage construction projects.

C. Bidder agrees to provide upon written request of the City all information related to its qualifications and those of its key personnel and its proposed Subcontractors.

D. Bidder certifies that its Bid is in all respects fair, and is made without collusion on the part of any person, firm, or corporation mentioned below, and that no officer or employee of the City is personally or financially interested, directly or indirectly, in the Bid, or in any purposes of, or the sale of, any materials or supplies for the work to which it relates, or any portion of the profits thereof.

1.07 DESIGNATED/AUTHORIZED REPRESENTATIVE

A. Bidder designates _____ of its office to which notice of acceptance of this Bid may be mailed, emailed or delivered.

B. City may provide notice of any kind to the Bidder using the email address Bidder provides below.

1. A notice is considered delivered to the Bidder on the date it is emailed to the email address.

1.08 INTERESTED PARTIES

A. The full names and residences of all persons and parties interested in this Bid as principals are as follows:

NAME TITLE ADDRESS

_____

_____

_____

_____

_____

_____

_____

_____

1.09 BID FORM SIGNATURES

A. By submitting this Bid, Bidder certifies that it has reviewed the insurance requirements of Section 00 72 00 - GENERAL CONDITIONS and certifies that coverage will be provided as required.

B. The undersigned also hereby certifies that, within the three-year period immediately preceding the bid solicitation date for this Project, the Bidder has not been determined by a final and binding citation and notice of assessment issued by the department of labor and industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW. The undersigned declares under penalty of perjury under the laws of the State of Washington that the foregoing sentence is true and correct.

Signed this _____ day of _____, 2024

Name of Bidder: _____

Signature of Bidder's Authorized Agent: _____

Title: _____

Phone: _____

City and State Where Signed: _____

State of Incorporation _____Contractor's License No._____

Washington State_____

Email address of Bidder's authorized Agent:

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 00 41 13

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SECTION 00 43 13
BID SECURITY FORM

BID SECURITY/DEPOSIT

Bidder herewith guarantees its bid by depositing one of the following with its bid/proposal in an amount of five percent (5%) or more of the bidder's total bid/proposal:

- ☐ Certified check
- ☐ Cashier's check
- ☐ Bid Bond

_____
Signature

BID BOND

Bond No. _____
Project: WFP Air Scour Blower Building Replacement
Project No. 3813

KNOW ALL MEN BY THESE PRESENTS,
that _____ [Contractor], a corporation organized under the laws of the State of _____, and registered to do business in the State of Washington as a contractor, as Principal, and _____ [Surety], a corporation organized under the laws of the State of _____ and registered to transact business in the State of Washington, as Surety, their heirs, executors, administrators, successors and assigns, are jointly and severally held and bound to the City of Everett, Washington, hereinafter called "City", and are similarly held and bound unto the City in the sum of _____ and __/100's Dollars ($_____), the payment of which, well and truly to be paid, we bind ourselves, our heirs, executors and successors, jointly and severally, formally by these presents.

NOW, THEREFORE, the condition of this obligation is such that the Surety is held and bound to the City to pay and forfeit to the City the amount of this bond as provided herein, upon the conditions contained herein, unless the conditions for release contained herein are satisfied or expressly waived in a writing signed by the City Attorney.

It is expressly understood and agreed that:

A. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to the City upon default of Bidder the penal sum set forth on the face of this Bond.

B. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the bidding documents the executed Contract required by the bidding documents, any performance and payment bonds required by the bidding documents and Contract Documents, and evidence of insurance required by the bidding documents and Contract Documents.

C. This obligation shall be null and void if:

1. The City accepts Bidder's bid and Bidder delivers within the time required by the bidding documents (or any extension thereof agreed to in writing by the City) the executed Contract required by the bidding documents, any performance and payment bonds required by the bidding documents and Contract Documents, and evidence of insurance required by the bidding documents and Contract Documents, or
2. All bids are rejected by the City.

D. Payment under this Bond will be due and payable upon default of Bidder and within thirty (30) calendar days after receipt by Bidder and Surety of written notice of default from the City, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

E. Surety waives notice of any and all defenses based on or arising out of any time extension to issue notice of award agreed to in writing by the City and Bidder, provided that the time for issuing notice of award including extensions shall not in the aggregate exceed one hundred twenty (120) days from Bid Due Date without Surety's written consent.

F. No suit or action shall be commenced under this Bond prior to thirty (30) calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety. Any suit or action under this bond must be instituted within the time period provided by applicable law.

G. The laws of the State of Washington shall apply to the determination of the rights and obligations of the parties hereunder. Venue for any dispute or claim hereunder shall be the state courts of Washington in Snohomish County, Washington.

H. Notice required hereunder shall be in writing sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or United States Registered or Certified Mail, return receipt requested, postage prepaid, and shall be deemed to be effective upon receipt by the party concerned.

I. Surety shall cause to be attached to this Bond current and effective Power of Attorney evidencing authority of the officer, agent or representative to execute this Bond on behalf of Surety to execute and deliver such Bond and bind the Surety thereby.

J. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of the Bond conflicts with any applicable provision of any applicable statue, then the provision of said statue shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

K. The term "bid" as used herein includes a bid, offer or proposal as applicable.

BIDDER	SURETY
_____ Bidder's Name	_____ (seal) Surety's Name and Corporate Seal
By: _____ Signature, Title, and Date	By: _____ Signature, Title, and Date
Address: _____ _____	Address: _____ _____
Attest: _____ Signature, Title and Date	Attest: _____ Signature, Title and Date

END OF SECTION 00 43 13

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SECTION 00 43 36
PROPOSED SUBCONTRACTORS FORM

1. For heating, ventilation and air conditioning, plumbing (as defined by RCW Chap. 18.106) and electrical work (as defined by RCW Chap. 19.28), and structural steel installation and rebar installation, Bidder MUST either identify itself or Subcontractors in the chart below. If Bidder believes such work is not part of the Work, Bidder shall write "NO WORK".

2. Bidder shall not list more than one Subcontractor for each category of Work identified, unless Subcontractors vary with Bid alternates, in which case the Bidder must indicate which Subcontractor will be used for which alternate.

3. **Bidder's Bid shall be deemed non-responsive and void if:**

   A. For heating, ventilation and air conditioning, plumbing, electrical work, structural steel installation and rebar installation, Bidder fails: (1) to submit as part of the Bid the names of such Subcontractors; (2) to name itself to perform such Work; or (3) to write "No Work"; or

   B. Bidder names two or more Subcontractors to perform the same Work.

4. The requirement to name the Bidder's proposed heating, ventilation, air conditioning, plumbing, electrical, structural steel installation and rebar installation subcontractors applies only to proposed heating, ventilation, air conditioning, plumbing, electrical, structural steel installation and rebar installation subcontractors who will contract directly with the general contractor submitting the Bid to the City.

5. The heating, ventilation and air conditioning, plumbing, and electrical portions of the chart below must be submitted with the bid proposal or within one hour of the published bid submittal time.

6. The structural steel installation and rebar installation portions of the chart below must be submitted with the bid proposal or within forty-eight hours of the published bid submittal time.

Type/Scope of Work	**Name and Address of Subcontractor or Bidder**
HEATING Subcontractor, bidder or "no work" **MUST** be stated	
VENTILATION AND AIR CONDITIONING Subcontractor, bidder or "no work" **MUST** be stated	
PLUMBING (as described in RCW Chap. 18.106) Subcontractor, bidder or "no work" **MUST** be stated	
ELECTRICAL (as described in RCW Chap. 19.28) Subcontractor, bidder or "no work" **MUST** be stated	
STRUCTURAL STEEL INSTALLATION Subcontractor, bidder or "no work" **MUST** be stated	
REBAR INSTALLATION Subcontractor, bidder or "no work" **MUST** be stated	

END OF SECTION 00 43 36

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SECTION 00 45 13
BIDDER QUALIFICATION STATEMENT

PROJECT NAME: WFP Air Scour Blower Building Replacement

CONTRACTOR'S
COMPANY NAME: _____

DATE: _____

ADDRESS: _____

TELEPHONE: _____

The Bidder must document that the Bidder meets the Supplemental Responsibility Criteria in the Supplementary Instructions to Bidders (Section 00 2213). The Bidder should provide additional sheets to fully describe referenced projects and experience.

1. The Supplementary Instructions to Bidders (Section 00 2213) states that the Bidder must have successfully completed at least 3 Similar Projects within the 10 years prior to bid opening. List the Similar Projects that show that Bidder has this experience:

PROJECT NAME	**YEAR**	**OWNER**	**LOCATION**

Furnish references for information concerning all work listed above:

NAME	TITLE	PHONE NUMBER	EMAIL ADDRESS

2. The Supplementary Instructions to Bidders (Section 00 2213) states that the Bidder's project manager for the Project must have successfully supervised the completion of at least 3 Similar Projects within the 10 years prior to bid opening. List the project manager's name and projects that show that he or she has this experience:

   Name: _____

PROJECT NAME	YEAR	OWNER	LOCATION

Furnish references for information concerning all work listed above:

NAME	TITLE	PHONE NUMBER	EMAIL ADDRESS

3. The Supplementary Instructions to Bidders (Section 00 2213) states that the Bidder's superintendent for the Project must have successfully supervised the completion of at least 3 Similar Projects within the 10 years prior to bid opening. List the superintendent's name and projects that show that he or she has this experience:

   Name:_____

PROJECT NAME	**YEAR**	**OWNER**	**LOCATION**

   Furnish references for information concerning all work listed above:

NAME	**TITLE**	**PHONE NUMBER**	**EMAIL ADDRESS**

4. The Supplementary Instructions to Bidders (Section 00 2213) states that the Bidder's principal foreman for the Project must have successfully supervised the completion of at least 3 Similar Projects within the 10 years prior to bid opening. List the principal foreman's name and projects that show that he or she has this experience:

   Name:_____

PROJECT NAME	**YEAR**	**OWNER**	**LOCATION**

Furnish references for information concerning all work listed above:

NAME	**TITLE**	**PHONE NUMBER**	**EMAIL ADDRESS**

5. Name and title of person filling out form:

_____ _____

NAME TITLE

END OF SECTION 00 45 13

SECTION 00 45 19
NON-COLLUSION AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF)

The undersigned, being duly sworn, on oath says that the bid submitted is a genuine and not a sham or collusive bid, or made in the interest or on behalf of any person not therein named; and the undersigned further says that the said bidder has not directly or indirectly induced or solicited any bidder on the above work or supplies to put in a sham bid, or any other person or corporation to refrain from bidding; and that said bidder has not in any manner sought by collusion to secure an advantage over any other bidder or bidders.

_____ _____
Firm Name Authorized Signature

SUBSCRIBED and SWORN to before me this _____ day of _____, 20_____.

_____ _____
NOTARY PUBLIC in and for the State of Washington, residing at _____

My commission expires:_____

END OF SECTION 00 45 19

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SECTION 00 45 39
RCW 35.22.650 CERTIFICATION

A set percentage of minority group member employees or minority business subcontracts is not required in the performance of the Work under this Contract. However, RCW 35.22.650 requires bidders (a) to actively solicit (i) employment of minority group members and (ii) subcontract bids from minority businesses, and (b) to submit evidence of its compliance with these requirements for active solicitations:

RCW 35.22.650

All contracts by and between a first-class city and contractors for any public work or improvement exceeding the sum of ten thousand dollars, or fifteen thousand dollars for construction of water mains, shall contain the following clause:

> "Contractor agrees that the contractor shall actively solicit the employment of minority group members. Contractor further agrees that the contractor shall actively solicit bids for the subcontracting of goods or services from qualified minority businesses. Contractor shall furnish evidence of the contractor's compliance with these requirements of minority employment and solicitation. Contractor further agrees to consider the grant of subcontracts to said minority bidders on the basis of substantially equal proposals in the light most favorable to said minority businesses. The contractor shall be required to submit evidence of compliance with this section as part of the bid."

As used in this section, the term "minority business" means a business at least fifty-one percent of which is owned by minority group members. Minority group members include, but are not limited to, blacks, women, native Americans, Asians, Eskimos, Aleuts, and Hispanics.

I. Bidder confirms that it actively solicits employment of minority group members. _____ *[yes or no]*

II. Please estimate the percentage of Bidder's employees on this Project that will be made up of minority group members: _____ [*state estimated percentage]*

III. Please estimate the percentage of goods and services that will be subcontracted to minority businesses on this Project: _____ *[state estimated percentage]*

IV. List all minority businesses from whom bids or quotes for goods or services on this Project have been solicited (attach additional sheet if necessary):

Minority Business Name	Address	Goods or Services Involved	Certification Number*

*Certification numbers (for MBE, MWBE, DBE, etc.) are found at Office of Minority & Women's Business Enterprises: https://omwbe.diversitycompliance.com/FrontEnd/SearchCertifiedDirectory.asp. If a minority business does not have a certification number, the Bidder must provide with this certification form evidence that the business is at least fifty-one percent owned by minority group members.

During Contract performance, or in any event prior to final payment, Bidder shall provide the City with the names and addresses of all minority businesses actually awarded subcontracts under the Contract. In the event that a subcontract bid or quote is solicited and listed above and a subcontract is not awarded to the minority business so listed, Contractor shall state the reasons such subcontract was not awarded to the minority business and shall provide the minority business quote together with the actual subcontract price paid and the name of the subcontractor to whom the subcontract was subsequently awarded.

FAILURE TO PROPERLY COMPLETE AND SUBMIT THIS CERTIFICATION FORM WITH THE BID WILL RESULT IN REJECTION OF BID. THE BIDDER CERTIFIES UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF WASHINGTON THAT THE ABOVE IS TRUE AND COMPLETE CORRECT TO THE BEST OF ITS KNOWLEDGE AND BELIEF AND FURTHER AGREES TO PROVIDE INFORMATION AS REQUESTED BY THE CITY REGARDING MINORITY BUSINESS SUBCONTRACTS AND EMPLOYMENT OF MINORITY GROUP MEMBERS.

Signature: _____ Date: _____

END OF SECTION 00 45 39

SECTION 00 52 13
AGREEMENT FORM

CONTRACT

THIS CONTRACT is made and entered by and between the City of Everett, Washington, a municipal corporation existing under the laws of the State of Washington (the "City") and _____, (the "**Contractor**").

In consideration of the sums to be paid to it by the City, Contractor hereby covenants and agrees to furnish all labor, tools, materials, equipment, and supplies required to complete in a workmanlike manner the work, improvements, and/or appurtenances in accordance with the Specifications and Drawings and all other Contract Documents entitled: "_____" (the "**Project**").

1. **Contract Documents.** The "Contract Documents" are defined in the General Conditions. The Contract Documents are part of this Contract and are hereby incorporated by reference. Terms that are capitalized in a Contract Document but not defined in that Contract Document shall have the meaning defined to them in the other Contract Documents. A copy of the Contract Documents that were posted for the Project on Builder's Exchange of Washington (www.bxwa.com) as of Bid Opening Date is maintained by the City Clerk's Office as a single PDF and is available as follows:

Link to PDF	

Contractor acknowledges that Contractor has downloaded and reviewed this PDF prior to signing this Contract. City and Contractor agree that this PDF contains all posted Contract Documents as of the Bid Opening Date. City and Contractor further agree that this PDF may contain some other documents (such as Reference Information) that are not Contract Documents.

2. **Contract Time.** Substantial Completion of the Work shall be achieved within Three-Hundred Sixty (360) calendar days after the effective date of the Notice to Proceed. Physical Completion shall be within Thirty (30) calendar days after the actual date of issuance of Substantial Completion.

3. **Liquidated Damages.** The parties agree the City will suffer damage and be put to additional expense in the event that the Contractor does not complete the Work in all respects and have it ready for use by the Substantial and Physical Completion dates stated above. Because it is difficult to accurately compute the amount of such costs and damages, the Contractor hereby covenants and agrees to pay to the City liquidated damages for each and every calendar day (or working day, if Contract Time is described in working days) in the amounts set forth in this Section. For failure to achieve Substantial Completion by the Substantial Completion date stated above, the Contractor shall pay liquidated damages to the City computed at the daily rate of fifteen percent (15%) of the Contract Sum divided by the number of days of Contract Time stated above. Once Substantial Completion is achieved, for failure to achieve Physical Completion by the Physical Completion Date stated above, the Contractor shall pay liquidated damages at the daily rate of ten percent (10%) of the liquidated damages rate applicable to delays to Substantial Completion.

4. Contract Sum. The Contract Sum of this Contract is:

+ WA Sales Tax (as applicable)	
Contract Sum	

This is based on the proposal/bid submitted by Contractor dated _____.
A copy of this proposal/bid is attached hereto.

The basis for final payment will be the actual amount of work performed according to the Contract Documents and payments, whether partial or final, shall be made as specified therein. If, and to the extent, payment (in whole or in part) is based upon unit prices multiplied by quantities of work actually performed, the total amount paid to the Contractor may be less than Contract Sum stated herein and the Contractor agrees to execute one or more change orders in such event. In no event shall the total amount paid Contractor exceed the Contract Sum stated herein, unless the Contract amount has first been increased by one or more Change Orders signed by the City. The City may, in its sole discretion, withhold amounts from payments otherwise due as offsets or back charges for expenses, damages, liquidated damages or costs for which the Contractor is liable for not to exceed 10% of the total amount of the contract. If the City chooses not to offset or deduct any such expenses, damages, liquidated damages or costs from one or more payments or return of retainage, the City does not waive its claim for such damages and hereby expressly reserves its right to assert a claim against the Contractor for such damages.

5. Withholding. Five percent (5%) of amounts due Contractor shall be retained and withheld to comply with RCW Chap. 60.28. Retained amounts shall only be released: (A) as required by law or (B) sixty (60) days after completion of all contract work if there are no claims against the retained funds. In addition to the amounts required by RCW 60.28 to be withheld from the progress or retained percentage payments to the Contractor, the City may, in its sole discretion, withhold any amounts sufficient to pay any claim against the Contractor of which the City may have knowledge and regardless of the informalities of notice of such claim arising out of the performance of this Contract. The City may withhold the amount until either the Contractor secures a written release from the claimant, obtains a court decision that such claim is without merit, or satisfies any judgment in favor of the claimant on such claim. The City shall not be liable for interest during the period the funds are so held.

6. Compliance with Employment and Wage Laws. Contractor agrees to comply with all state and federal laws relating to the employment of labor and wage rates to be paid.

7. RCW 35.33.650. Contractor shall actively and in good faith solicit the employment of minority group members and bids for the supply of goods or subcontracting of services from qualified minority businesses. Contractor shall consider granting contracts to possible minority suppliers and subcontractors on the basis of substantially equal proposals in the light most favorable to the minority businesses. Contractor shall furnish evidence of its compliance with these requirements. As used in this section, the term “minority business” means a business at least fifty-one percent (51%) of which is owned by minority group members. Minority group members include, but are not limited to,

African-Americans, Women, Native Americans, Asian/Pacific Islander-Americans, and Hispanic-Americans.

8. Indemnification.

A. Contractor will defend, indemnify and hold harmless the City from any and all Claims arising out or relating to any acts, errors, omissions, or conduct by Contractor in connection with its performance of this Contract, including without limitation (and without limiting the generality of the foregoing) all Claims resulting from Contractor's performance of, or failure to perform, its express and implied obligations under the Contract. The Contractor will defend and indemnify and hold harmless the City whether a Claim is asserted directly against the City, or whether a Claim is asserted indirectly against the City, e.g., a Claim is asserted against someone else who then seeks contribution or indemnity from the City. The amount of insurance obtained by, obtainable by, or required of the Contractor does not in any way limit the Contractor's duty to defend and indemnify the City. The City retains the right to approve Claims investigation and counsel assigned to said Claim and all investigation and legal work regarding said Claim shall be performed under a fiduciary relationship to the City. This Section 8 is in addition to any other defense or indemnity or hold harmless obligation in the Contract Documents.

B. The Contractor's obligations under this Section 8 shall not apply to Claims caused by the sole negligence of the City. If (1) RCW 4.24.115 applies to a particular Claim, and (2) such Claim is caused by or results from the concurrent negligence of (a) the Contractor and (b) the City, then the Contractor's liability under this Section 8 shall be only to the extent of the Contractor's negligence.

C. As used in this section: (1) "City" includes the City's officers, employees, agents, and representatives; (2) "Claims" include all losses, claims, demands, expenses (including, but not limited to, attorney's fees and litigation expenses), suits, judgments, or damage, whether threatened, asserted or filed against the City, whether such Claims sound in tort, contract, or any other legal theory, whether such Claims have been reduced to judgment or arbitration award, irrespective of the type of relief sought or demanded (such as money or injunctive relief), and irrespective of the type of damage alleged (such as bodily injury, damage to property, economic loss, general damages, special damages, or punitive damages); and (3) "Contractor" includes Contractor, its employees, agents, representatives and subcontractors. If, and to the extent, Contractor employs or engages subcontractors, then Contractor shall ensure that each such subcontractor (and subsequent tiers of subcontractors) shall expressly agree to defend and indemnify and hold harmless the City to the extent and on the same terms and conditions as the Contractor pursuant to this section.

9. Insurance. The Contractor shall purchase and maintain such insurance as set forth in the Contract Documents. Failure to maintain such insurance shall be a material breach of the Contract. The City shall be entitled to damages for such a breach that include, but are not limited to, any loss (including, but not limited to, third party litigation expenses and professional fees) suffered by the City if the City is determined to be solely or concurrently negligent, and if the City suffers any loss or must pay or defend against any such claim, suit, demand or damage as a result of such breach.

10. Waiver of Industrial Insurance Immunity. Contractor waives any right of contribution against the City. It is agreed and mutually negotiated that in any and all claims against the City, its agents or employees, the Contractor, a subcontractor, anyone directly or indirectly employed by the Contractor or subcontractor, or anyone for whose acts any of them may be liable, the defense and indemnification obligations hereunder shall not be limited in any way by any limitation on the amount of damages, compensation, or benefits payable by or for the Contractor or any subcontractor under industrial worker's compensation acts, disability benefit acts, or other employees' benefit acts. Contractor's and City's signatures hereto indicate specific waiver of Contractor's industrial insurance immunity in order to fulfill the indemnities hereunder. Solely for the purpose of indemnification and defense as provided in this Contract, the Contractor specifically waives any immunity under the State Industrial Insurance Law, Title 51 RCW. The Contractor expressly acknowledges that this waiver of immunity under Title 51 RCW was the subject of mutual negotiation and was specifically entered into pursuant to the provisions of RCW 4.24.115.

11. Repair of Damage. The Contractor agrees to repair and replace all property of the City and all property of others damaged by it, its employees, subcontractors, suppliers and agents.

12. Pre-Bid Inspection and Risk of Loss. It is understood that the whole of the work under this contract is to be done at the Contractor's risk and that: (1) prior to submitting its proposal or bid, it became familiar with the conditions of excavation, subsurface, backfill, materials, climatic conditions, location, traffic, and other contingencies that may affect the work and has made its bid or proposal accordingly and (2) that it assumes the responsibility and risk of all loss or damage to materials or work that may arise from any cause whatsoever prior to completion.

13. Headings for Convenience Only. The headings in this document are for convenience only, and shall not be used or considered to interpret or construe this document.

14. Effective Date/Counterparts/Signature. This Contract is effective as of the date of the last person to sign it, and may be executed in multiple counterparts, each of which shall be deemed an original. This Contract may be signed with AdobeSign, and any such signature is fully binding.

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CITY OF EVERETT
WASHINGTON

By:

_____
Cassie Franklin, Mayor

_____
Date

ATTEST:

_____
Office of the City Clerk

STANDARD DOCUMENT
APPROVED AS TO FORM
OFFICE OF THE CITY ATTORNEY
(10.31.23)

CONTRACTOR:

_____
[Contractor's Complete Legal Name]

By: _____
Signature

Typed/Printed Name of Signer: _____

Title of Signer: _____

Date: _____

END OF SECTION 00 52 13

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SECTION 00 61 13
PERFORMANCE BOND AND PAYMENT BOND

PERFORMANCE BOND
Bond No.: _____

The City of Everett has awarded to _____ (Principal), a contract for the construction of the project designated as WFP Air Scour Blower Building Replacement Project, UP 3813, in Everett, Washington (Contract), and said Principal is required to furnish a bond for performance of all obligations under the Contract.

The Principal, and _____ (Surety), a corporation organized under the laws of the State of _____ and licensed to do business in the State of Washington as surety and named in the current list of "Surety Companies Acceptable in Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Treasury Dept., are jointly and severally held and firmly bound to the City of Everett in the sum of _____ US Dollars ($_____), which is the Contract Sum, subject to the provisions herein.

This statutory performance bond shall become null and void, if and when the Principal, its heirs, executors, administrators, successors, or assigns shall well and faithfully perform all of the Principal's obligations under the Contract and fulfill all the terms and conditions of all duly authorized modifications, additions, and changes to said Contract that may hereafter be made, at the time and in the manner therein specified; and if such performance obligations have not been fulfilled, this bond shall remain in full force and effect.

The Surety agrees to indemnify, defend, and protect the City of Everett against any claim of direct or indirect loss resulting from the failure of the Principal, its heirs, executors, administrators, successors, or assigns (or any of the employees, subcontractors, or lower tier subcontractors of the Principal) to faithfully perform the Contract.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract, the specifications accompanying the Contract, or to the work to be performed under the Contract shall in any way affect its obligation on this bond, and waives notice of any change, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increased obligation.

This bond may be executed in two (2) original counterparts, and shall be signed by the parties' duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed and original power of attorney for the officer executing on behalf of the surety. The Surety agrees to be bound by the laws of the state of Washington and subjected to the jurisdiction of the state of Washington.

PRINCIPAL	SURETY
_____	_____
Printed Name: _____	Printed Name: _____
Title: _____	Title: _____
STANDARD BOND FORM OFFICE OF THE CITY ATTORNEY APPROVED AS TO FORM APPROVED AS TO CITY CHARTER § 4.1	Local Office/ Agent of Surety: Name:_____ Address:_____ Phone Number:_____ Email: _____

PAYMENT BOND
Bond No. _____

The City of Everett has awarded to _____ (Principal), a contract for the construction of the project designated as WFP Air Scour Blower Building Replacement Project, UP 3813, in Everett, Washington (Contract), and said Principal is required under the terms of that Contract to furnish a payment bond in accord with Title 39.08 Revised Code of Washington (RCW) and (where applicable) 60.28 RCW.

The Principal, and _____ (Surety), a corporation organized under the laws of the State of _____ and licensed to do business in the State of Washington as surety and named in the current list of "Surety Companies Acceptable in Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Treasury Dept., are jointly and severally held and firmly bound to the City of Everett in the sum of _____ US Dollars ($_____), which is the Contract Sum, subject to the provisions herein.

This statutory payment bond shall become null and void, if and when the Principal, its heirs, executors, administrators, successors, or assigns shall pay all persons in accordance with RCW Titles 39.08 and 39.12 including all workers, laborers, mechanics, subcontractors, and material suppliers, and all persons who shall supply such contractor or subcontractor with provisions and supplies for the carrying on of such work, and all taxes incurred on said Contract under Title 50 and 51 RCW and all taxes imposed on the Principal under Title 82 RCW; and if such payment obligations have not been fulfilled, this bond shall remain in full force and effect.

The Surety agrees to indemnify, defend, and protect the City of Everett against any claim of direct or indirect loss resulting from the failure of the Principal, its heirs, executors, administrators, successors, or assigns, (or the subcontractors or lower tier subcontractors of the Principal) to pay all laborers, mechanics, subcontractors, lower tier subcontractors material persons, and all persons who shall supply such contractor or subcontractors with provisions and supplies for the carrying on of such work.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract, the specifications accompanying the Contract, or to the work to be performed under the Contract shall in any way affect its obligation on this bond, and waives notice of any change, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increased obligation.

This bond may be executed in two (2) original counterparts, and shall be signed by the parties' duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed and original power of attorney for the officer executing on behalf of the surety. The Surety agrees to be bound by the laws of the state of Washington and subjected to the jurisdiction of the state of Washington.

PRINCIPAL	SURETY
_____	_____
Printed Name: _____	Printed Name: _____
Title: _____	Title: _____

STANDARD BOND FORM *OFFICE OF THE CITY ATTORNEY* *APPROVED AS TO FORM* *APPROVED AS TO CITY CHARTER § 4.1*	Local Office/ Agent of Surety: Name:_____ Address:_____ Phone Number:_____ Email: _____

END OF SECTION 00 61 13

SECTION 00 61 23
NEW RETAINAGE BOND

BOND NO. _____
RETAINAGE BOND

KNOW ALL MEN BY THESE PRESENTS, that _____, a corporation organized under the laws of the State of _____, and registered to do business in the State of Washington as a contractor, as Principal, and _____, a corporation organized under the laws of the State of _____ and registered to transact business in the State of Washington as Surety, their heirs, executors, administrators, successors and assigns, are jointly and severally held and bound to the City of Everett, Washington, hereinafter called "City", and are similarly held and bound unto the beneficiaries of the trust fund created by RCW Chapter 60.28, in the sum of _____Dollars ($_____) plus five (5%) percent of any increases that may occur under the Contract (as defined below), the payment of which, well and truly to be paid, we bind ourselves, our heirs, executors and successors, jointly and severally, formally by these presents.

THE CONDITIONS OF THE ABOVE OBLIGATION ARE THAT:

WHEREAS, the Principal has executed a contract _____ (the "Contract") with the City known as:

PROJECT NAME: WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

CONTRACT NUMBER: UP 3813

WHEREAS, said Contract and RCW Chapter 60.28 require the City to withhold from monies earned by the Principal during the progress of the construction, hereinafter referred to as "earned retained funds";

WHEREAS, the Principal requested that the City accept a retainage bond and release earned retained funds to Principal, as allowed under RCW Chapter 60.28; and

NOW, THEREFORE, the condition of this obligation is such that the Surety is held and bound to the City to indemnify, defend and hold the City harmless from any and all loss, costs or damages that the City may sustain by reason of release of said earned retained funds to Principal, then this obligation to be null and void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, it is expressly understood and agreed that:

1. Any suit or action under this bond must be instituted within the time period, if any, provided by applicable law. The bond shall be subject to all claims and liens provided for by law or Contract against the earned retained funds and in the same manner and priority as set forth for retained percentages in RCW Chapter 60.28 and the Contract.

2. The Surety hereby consents to and waives notice of any extension in the time for performance of the Contract, assignment of obligations under the Contract, or Contract alteration, termination, amendment or change order. This expressly includes, but is not limited to, consent to and waiver of any notice with respect to increases in the Contract price by change order. Upon any such Contract price increase, the amount of this bond automatically increases by an amount equal to 5% of Contract price increase.

3. Until written release of this obligation by the City, this bond may not be terminated or canceled by the Principal or Surety for any reason. Any extension of time for the Principal's performance on the Contract, assignment of obligations under the Contract, or Contract alteration, amendment or change order shall not release the Surety from its obligation under this bond.

4. RCW Chapter 60.28 authorizes the City to substitute a retainage bond in lieu of earned retained funds and the Surety hereby waives any defense that this bond is void or otherwise not authorized by law.

5. Any claim or suit against the City to foreclose the liens provided for by RCW Chapter 60.28 shall be effective against the Principal and Surety and any judgment under RCW Chapter 60.28 against the City shall be conclusive against the Principal and the Surety.

6. The laws of the State of Washington shall apply to the determination of the rights and obligations of the parties hereunder. Venue for any dispute or claim hereunder shall be the state courts of Washington in Snohomish County, Washington.

SIGNED AND SEALED THIS _____ of _____, 20__.

_____ Surety By: _____ Typed/Printed Name: _____ Title: _____	_____ Principal By: _____ Typed/Printed Name: _____ Title: _____

STANDARD RETAINAGE BOND FORM
OFFICE OF THE CITY ATTORNEY
APPROVED AS TO FORM
APPROVED AS TO CITY CHARTER § 4.1

END OF SECTION 00 61 23

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SECTION 00 61 25
RETAINAGE ESCROW AGREEMENT

Project	WFP Air Scour Blower Building Replacement
Contractor	
Bank	

RETAINAGE ESCROW AGREEMENT AND INSTRUCTIONS

1. ***Escrow Agreement***. The Contractor on a public improvement project for the City exercised its option pursuant to RCW 60.28.011 to place Retainage in escrow with the Bank. This Agreement constitutes both the escrow agreement between the City and Contractor and instructions to the Bank for handling of the Escrow Account. This Agreement is not effective until (a) the Agreement has been signed by the Contractor, Bank and City and (b) Contractor, Bank and City have entered the appropriate information in Exhibit A.
2. ***Check Issuance, Endorsement, and Deposit***. From time to time, the City will issue a Check payable to the Bank and Contractor jointly. Contractor expressly authorizes and grants the power to the Bank to endorse the check on its behalf, to negotiate the check, collect the funds represented by the Check, and to deposit the funds so collected into the Escrow Account. These powers shall be deemed to be powers coupled with an interest and shall be irrevocable during the term of this escrow.
3. ***Investment of Funds***. Funds and cash balances in the Escrow Account may be invested in Eligible Securities at the direction of the Contractor. For purchase of Eligible Securities, the Bank may follow the last written direction it received from the Contractor, provided such direction provides for investment in Eligible Securities. The Bank shall not invest any funds, cash balances, or proceeds of sale of Eligible Securities in any securities, bonds or accounts that are not Eligible Securities. Eligible Securities purchased pursuant to this Agreement shall be held by the Bank as custodian as part of this escrow. Eligible Securities shall be held in the Bank's name. Interest on the purchased Eligible Securities, if any, shall be paid to Contractor when, as and if any accrued interest is received by the Bank.
4. ***Eligible Securities.*** The following securities are deemed Eligible Securities, and the Bank may invest funds and cash balances in such securities at the direction of Contractor without further approval of the City, provided that any maturity dates are no later than twenty-five (25) calendar days after the Completion Date and provided they are held in a manner and form that allows Bank alone to liquidate the securities as provided for in the Agreement.
   A. Bills, certificates, notes or bonds of the United States;
   B. Other obligations of the United States or its agencies;
   C. Obligations of any corporation wholly owned by the Government of the United States;
   D. Indebtedness of the Federal National Mortgage Association;
   E. Time deposits in commercial banks; and
   F. Mutual funds, pools, or investment trusts, provided the investments of the fund, pool or trust consists solely of securities listed in herein.

Other securities may be deemed Eligible Securities upon the written request of the Contractor and written approval of the City, provided the City has the staff assistance and expertise which will permit it to exercise sound judgment in assessing the security. The City shall consider probable safety, risk to principal, liquidity and any other factor the City deems reasonable to consider. Nothing herein obligates the City to incur any expense or charge to assess the appropriateness of a proposed security. The City has no obligation to consider a proposed security if the City would incur expenses, charges or fees in its assessment of the appropriateness of the security as an investment. If the proposed security has a maturity date, the security must mature on or before the Completion Date. The Contractor expressly acknowledges that any investment in securities involves risks, including, but not limited to, the risks of loss or diminution of principal and failure to realize anticipated or expected appreciation, dividends, interest, or other gain. Contractor expressly waives and releases both City and Bank from any and all liability associated with, or arising out of, these and all market risks.

5. ***Bank Duties and Responsibilities***. Although the Bank will be a joint payee of any Check, the Bank shall only have (a) those duties and responsibilities that a depository bank would have pursuant to Article 4 of the Uniform Commercial Code of the State of Washington for an item deposited to Bank and (b) those duties and responsibilities created by this Agreement. The Bank must not deliver to the Contractor all or any part of the securities or money held by the Bank pursuant to this Agreement (or any proceeds from the sale of such securities, or the negotiation of the City's warrants or checks) except in accordance with written instructions from the City. The City Clerk is authorized to give written instructions and the Finance Director or Treasurer (or its designee) is authorized to give written approval of securities. Written instructions and written approval of securities must be countersigned by the City Attorney. The City may designate different authorized persons from time to time by notifying the Bank in writing of the change, which notice must be countersigned by the City Attorney.

6. ***Change of Completion Date***. Upon written request by the Bank, City shall advise the Bank in writing of any change in the Completion Date. If the changed Completion Date is later than the original Completion Date, the Bank may reinvest any funds on hand, cash balances or proceeds of Eligible Securities with maturities, reverse loads, etc. consistent with the later Completion Date. If the changed Completion Date is earlier than the original Completion Date, the Bank shall execute such transactions as are commercially reasonable to liquidate Eligible Securities in the Escrow Account no later than twenty-five (25) calendar days after the earlier Completion Date.

7. ***Return of Funds to City***. At the City’s sole option and notwithstanding any other provision of this Agreement, the City may direct the Bank in writing to liquidate any and all Eligible Securities held in or for the Escrow Account and to deliver all funds, cash, accrued interest and proceeds in the Escrow Account to the City. Such liquidation shall occur within thirty-five (35) calendar days of receipt of the written direction.

8. ***Compensation of Bank***. Contractor shall be solely responsible for, and shall pay separately to the Bank, any and all fees, charges, or commissions of the Bank relating to the Escrow Account. No fees, charges or commissions of any kind may be deducted by the Bank from any property, funds, proceeds or Eligible Securities in the Escrow Account until and unless the City directs the release of the Escrow Account to the Contractor, in which case the Bank is hereby granted a lien upon the property, proceeds or Eligible Securities in the Escrow Account for the entire amount of unpaid Bank fees, costs or charges arising out of or relating to the Escrow Account. Said lien arises and is effective upon the City’s written direction to release the Escrow Account to the Contractor. The City shall not be liable for any fees, charges, expenses or commissions relating to the Escrow Account or any Eligible Securities.

9. Termination of Escrow By Bank. Bank may terminate the escrow by giving written notice to the City and Contractor. Within twenty (20) calendar days of the receipt of such notice, the City and Contractor shall jointly appoint a successor escrow holder and instruct Bank to deliver all securities and funds of the Escrow Account to said successor. If Bank is not so notified of the appointment of a successor escrow holder, Bank may return all funds, securities and contents of the Escrow Account to the City

10. Definitions

"*Agreement*" shall mean this document, including exhibit, when completely executed by the City, Contractor and Bank.

"*Bank*" shall mean that national or state chartered bank identified in Exhibit A that holds the escrow.

"*Check*" shall mean a check or warrant payable jointly to the Bank and Contractor, representing accrued Retainage.

"*City*" shall mean the City of Everett, a municipal corporation of the State of Washington

"*Completion Date*" shall mean that date occurring immediately after the expiration of the project duration (as defined by the contract for the public improvement), including any agreed extensions thereof. The initial Completion Date can be found at the top of the first page of this Agreement.

"*Contractor*" shall mean the undersigned contractor.

"*Escrow Account*" shall mean the escrow created by this Agreement.

"Eligible Securities" are those bonds and securities identified in the paragraph entitled, ***Eligible Securities*** on page 1 above.

"*Retainage*" shall mean moneys reserved by the City under the provisions of a public improvement contract.

11. Miscellaneous. With the possible exception of any agreement between the Bank and Contractor regarding amount and payment of fees, commissions and charges related to the Escrow Account, this document contains the entire agreement between the Bank, Contractor and the City with respect to this Escrow Account. This Agreement binds the assigns, successors, personal representatives and heirs of the parties hereto. Those persons executing this Agreement represent and warrant they are duly authorized to bind their principals to this Agreement and to execute this Agreement on their behalf. Venue for any dispute arising out of, or related to, this Agreement shall be Snohomish County, Washington. This Agreement shall be executed in triplicate, each of which shall be deemed to be an original.

AGREED AND ACCEPTED this the __ day of _____, 20__. Contractor: By: _____ Typed or Printed Name: _____ Title: _____ Address: _____ City: _____ State: _____ Zip: _____	AGREED AND ACCEPTED by the City of Everett this the day of , 20 . By _____ Cassie Franklin, Mayor ATTEST: City Clerk
PART 1 - AGREED AND ACCEPTED this the __ day of _____, 20__. BANK: _____ By: _____ Typed or printed name: _____ Its _____	STANDARD DOCUMENT APPROVED AS TO FORM OFFICE OF THE CITY ATTORNEY (10.22.21)

EXHIBIT A

City Supplied Information. The City provides the following information:

CITY SUPPLIED INFORMATION		
Project	WFP Air Scour Blower Building Replacement	
	Name	Work Order # UP3813
Contractor		
	City Vendor #	
Bank		
	City Vendor #	
Completion Date	(as of Agreement date)	

Bank Supplied Information. Bank provides the following information:

BANK SUPPLIED INFORMATION		
Bank		
	Name	
	Branch	
	Address/Phone	
	Contact Person/Account Officer	
Escrow Account		
	Account Name	Bank Account #

Contractor Supplied Information. Contractor provides the following information:

CONTRACTOR SUPPLIED INFORMATION	
Contractor	
	Name
	Address/Phone
	Representative Authorized to Direct Investment

END OF SECTION 00 61 25

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SECTION 00 63 63
CHANGE ORDER - AGREED

EVERETT
WASHINGTON

Change Order No._____
Change Order Effective Date:_____

CITY OF EVERETT
CHANGE ORDER

Project Title _____

Department _____

Work Order No. _____

Contractor: _____

Contract Award Date: _____

City Staff Contact: _____

Change Order No. _____

Change Order Effective Date _____

CONTRACT SUM

	Original Contract Sum	**Total of Previous Change Orders**	**This Change Order**	**Contract Sum After this Change Order**
Amount	$	$	$	$
+ WSST	$	$	$	$
Total	$	$	$	**$**

CONTRACT TIME

Original Contract Time	Working Days ☐ / Calendar Days ☐
Date of Notice to Proceed	
Cumulative adjustment to time by *prior* Change Orders	
Adjustment to time by *this* Change Order	
New Contract Time (i*ncluding* this Change Order)	

Change Order No._____

Change Order Effective Date:_____

Contractor and City agree as follows:

1. The scope of Work shall be changed to the extent described in Exhibit A.
2. The amount of this Change Order for the changes described in Exhibit A, represents complete compensation for the changes described in Exhibit A, including all direct and indirect costs and impacts. The Contract Sum shall be adjusted as described in this Change Order.
3. Everett Municipal Code 3.80.050 sets forth the threshold amounts below which the Mayor or his designee is authorized to direct Contractor to perform additional work. In calculating such threshold amounts, Washington State sales tax, as applicable to the Work, has been considered.
4. The Contract Time of the Contract shall be adjusted to the extent described in this Change Order.
5. Contractor waives and releases any and all claims arising out of, or related to, this Change Order, the work described in Exhibit A, and all work and actual or constructive changes that occurred or began prior to the date of this Change Order, including, but not limited to, claims for equitable adjustment of time and compensation, delay, impact, overhead, or inefficiencies. This provision does not apply to requests for equitable adjustment of time or price for which the Contractor timely and properly provided notice of a differing site condition, protest, dispute, claim or Contract Claim as required by the Contract Documents. If the Contract Documents establish a time period for notice of a differing site condition, protest, dispute, claim, or Contract Claim that ends after the date of this Change Order, but relates to work performed prior to the date of this Change Order, then this provision does not apply if the Contractor timely and properly submits such notice.
6. This Change Order only changes the contract between Contractor and City to the extent explicitly provided herein.
7. Signature(s) on this Change Order may be by pdf, email, fax or other electronic means, in which case such signature(s) will have the same effect as an original ink signature. This Change Order may be signed in counterparts, each of which shall be deemed an original, and all of which, taken together, shall be deemed one and the same document.

Change Order No._____

Change Order Effective Date:_____

CITY		
_____ Mayor Date: _____	Attest: _____ City Clerk Date: _____	Standard Document Approved as to Form Office of the City Attorney (5.13.22)

Recommended By:			
Construction Manager (if applicable) _____ Date: _____	Project Manager (if applicable) _____ Date: _____	Engineering Manager (if applicable) _____ Date: _____	Department Director _____ Date: _____

CONTRACTOR	
By _____ Officer	Date: _____

Change Order No._____

Change Order Effective Date:_____

Exhibit A—Description of Changed Work

END OF SECTION 00 63 63

SECTION 00 63 95
CHANGE ORDER - UNILATERAL

EVERETT
WASHINGTON

Change Order No._____

Change Order Effective Date:_____

CITY OF EVERETT
UNILATERAL CHANGE ORDER

Project Title _____

Department _____

Work Order No. _____

Contractor: _____

Contract Award Date: _____

City Staff Contact: _____

Change Order No. _____

Change Order Effective Date _____

CONTRACT SUM

	Original Contract Sum	**Total of Previous Change Orders**	**This Change Order**	**Contract Sum After this Change Order**
Amount	$	$	$	$
+ WSST	$	$	$	$
Total	$	$	$	**$**

CONTRACT TIME

Original Contract Time	Working Days ☐ / Calendar Days ☐
Date of Notice to Proceed	
Cumulative adjustment to time by *prior* Change Orders	
Adjustment to time by *this* Change Order	
New Contract Time (i*ncluding* this Change Order)	

Change Order No._____

Change Order Effective Date:_____

As allowed by the contract, the City directs the Contractor as follows:

1. The Scope of Work shall be changed to the extent described in Exhibit A.
2. The Contract Sum shall be adjusted as described in this Change Order.
3. The Contract Time of the Contract, and contractually scheduled completion date, shall be adjusted to the extent described in this Change Order.
4. Unless the Contractor timely and properly follows the procedures in the Contract Documents for seeking further equitable adjustment of time and compensation, including, but not limited to, delays, impacts, inefficiencies, overhead, and direct and indirect costs, and except as otherwise expressly provided herein, the Contractor will be barred from (a) asserting any claim for further adjustment of time and compensation arising out of, or relating to, the charges described in this Change Order or Work described in Exhibit A and (b) asserting an equitable adjustment of time or price arising earlier than the date of this Change Order. This provision does not apply to requests for equitable adjustment of time or price for which the Contractor timely and properly provided notice of a differing site condition, protest, dispute, claim or Contract Claim as required by the Contract Documents. If the Contract Documents establish a time period for notice of a differing site condition, protest, dispute, claim, or Contract Claim that ends after the date of this Change Order, but relates to work performed prior to the date of this Change Order, then this provision does not apply if the Contractor timely and properly submits such notice.
5. This Change Order only changes the Contract between Contractor and City to the extent explicitly provided herein.

Change Order No._____

Change Order Effective Date:_____

CITY		
_____ Mayor Date: _____	Attest: _____ City Clerk Date: _____	Standard Document Approved as to Form Office of the City Attorney (5.13.22)

Recommended By:			
Construction Manager (if applicable) _____ Date: _____	Project Manager (if applicable) _____ Date: _____	Engineering Manager (if applicable) _____ Date: _____	Department Director _____ Date: _____

Change Order No._____

Change Order Effective Date:_____

Exhibit A—Description of Changed Work

END OF SECTION 00 63 95

SECTION 00 72 00
GENERAL CONDITIONS

1. GENERAL INFORMATION

1.1 DEFINITIONS OF WORDS AND TERMS

Where used in the Contract Documents, the following words and terms shall have the meanings indicated. The meanings shall be applicable to the singular, plural, masculine and feminine of all words and terms.

Addenda: Written or graphic instruments issued prior to the opening of Bids that clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

Additive: A supplemental unit of work or group of bid items, identified separately in the Bid Form, that may, at the discretion of the City, be awarded in addition to the base Bid.

Alternative or Alternate: One of two or more units of Work or groups of bid items, identified separately in the Bid Form, from which the City may make a choice between different methods or material of construction for performing the same Work.

Application for Payment: Form acceptable to Owner that Contractor is to use during the course of the Work in requesting progress or final payments that is to be accompanied by such supporting documentation as is required by the Contract Documents.

Architect: An individual or entity retained by the Owner to be the Owner's representative with regard to matters of design intent. The terms "Owner's Representative", "Engineer" and "Architect" are interchangeable.

Award Date: The date of the formal action by the Everett City Council to accept the lowest responsible and responsive Bidder for the Work.

Bid: The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bid Form: The form provided to Bidders by the City for submittal of a Proposal or Bid to the City for a specific project.

Bidder: An individual, partnership, firm, corporation, or joint venture, submitting a Bid.

Bid Opening Date: The date the Everett City Clerk publicly opens and reads the Bids.

Call for Bids (Advertisement for Bids): The published public notice soliciting or Bids for Work stating, among other things, the time, place, and date for receiving and opening the Bids.

Change Order: Reference to Change Order shall include all rights of the Owner and Contractor under **ARTICLE 6. CHANGES**.

Completion Date: Date on which Project is ready for Final Acceptance. All physical Work, including Punch List, is complete and Contractor has completed and fulfilled all contractual obligations except any maintenance of landscaping. Contractual obligations that must be fulfilled prior to achievement of the Completion Date include, but are not limited to, the Contractor's furnishing all documentation (including correct, complete and accurate as-built or record drawings) and operation and maintenance manuals and transfer of warranties.

Contract: Agreement signed by the Owner and Contractor (Section 00 52 13). Depending on context, "Contract" may also refer to the Contract Documents as a whole. Contract Documents are defined in section **1.2** below.

Contract Claim: Any request by the Contractor for additional time or money (adjustment of Contract Sum or Contract Time) irrespective of the cause or reason for the request. Contract Claims include, but are not limited to, requests by the Contractor for additional time or money due to Extra Work, inefficiencies, Delays, interferences, and problems with the design. Contract Claim includes, but is not limited to, claims or requests by Subcontractors for extensions of

Contract Time, adjustment of Contract Sum, additional compensation that the Contractor attempts to pass through or assert against the Owner, or claims against the Owner arising out of a third party's claim against the Contractor.

Contract Sum: The price in dollars stated in the Contract to be paid by the Owner to the Contractor for the Work described in the Contract Documents, as modified by any Change Orders.

Contract Time: The duration of the Project as stated in the Contract and as modified by any Change Orders.

Contractor: The individual or entity with whom Owner has entered into the Agreement.

Day: Calendar day, unless explicitly stated otherwise.

Delay: Any increase of the duration of the critical path of the Project.

Dispute: Any controversy or disagreement.

Drawings: That part of the Contract Documents that graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor Submittals are not Drawings as so defined.

Effective Date of Agreement: See **18.10 EFFECTIVE DATE**.

Engineer: An individual or entity retained by the Owner to be the Owner's representative with regard to matters of design intent. The terms "Owner's Representative", "Engineer" and "Architect" are interchangeable.

Equipment: Mechanical, electrical, instrumentation, or other devices with one or more moving parts, or devices requiring an electrical, pneumatic, electronic, or hydraulic connection.

Extended Overhead: The increase in Overhead costs attributable to an extension of Contract Time.

Extra Work: Providing materials and Equipment and the performance of Work not directly called for in, or implied by, the Contract Documents, such that Contractor would be entitled to an adjustment of Contract Sum and possibly an extension of Contract Time.

Field Order: A written order issued by Owner's Representative that requires minor changes in the Work, but does not involve a change in the Contract Sum or the Contract Time.

Final Acceptance: Formal action by Everett City Council determining that all of the Contractor's Work has been completed, except for any landscaping maintenance.

Float: The amount of time between the early start date and the late start date, or the early finish date and the late finish date of any activity in the project schedule.

Force Account: Costs of performing Work as defined in **9.6. FORCE ACCOUNT**.

Furnish, Install, Perform, Provide, Supply: The word "Furnish" or the word "Install" or the word "Perform" or the word "Provide" or the word "Supply," or any combination or similar directive or usage thereof, shall mean furnishing and incorporating in the Work including all necessary labor, materials, equipment, and everything necessary to perform the Work indicated, unless specifically limited in the context used.

General Conditions: This Section 00 72 00 of the Contract Documents.

May: Conduct that is permitted, but not required.

Milestone: A principal event specified in the Contract documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

Notice: A signed, written communication by the Contractor to the Owner as described in **ARTICLE 10. NOTICE TO OWNER**.

Notice of Award: The written notice from the City of Everett to the successful Bidder signifying the City's acceptance of the Bid. No Contract is formed until the Effective Date.

Notice to Proceed: The written Notice from the Owner or Owner's Representative to the Contractor authorizing and directing the Contractor to proceed with the Work and establishing the date on which the Contract Time begins. Multiple and partial Notices to Proceed may be issued on a single Project.

Over-absorbed Overhead: Over recovery of fixed indirect costs that occurs when a Contractor performs more overall Work than it otherwise would have performed.

Overhead: For the purpose of calculating additional compensation under this section of the Contract, Overhead shall include only those costs that are expended for the administration of the business as a whole. Such costs usually accrue or are incurred due to the passage of time, and cannot be traced to a particular project or Contract. Examples of possible Overhead costs include, but are not limited to, General and Administrative salaries and benefits, rent, general company insurance (exclusive of insurance on owned equipment that is directly job costed), depreciation on office facilities, utilities, maintenance, office supplies, general company accounting and legal fees (exclusive of amounts expended directly on any specific project), personal property taxes, general company business licenses, dues and subscriptions.

The following costs and expenses are excluded from the definition and calculation of Overhead. Overhead costs that vary substantially with the volume of Work performed (as measured by billings) shall not be included in Overhead for the purpose of determining additional compensation for Extended or Unabsorbed Home Office Overhead or both.

Examples of costs that are not included in Overhead include, but are not limited to, travel and business meetings, telephones, professional fees expended for the benefit of a specific project, union welfare benefits, payroll taxes and equipment rental.

If related party transactions are included in a Contractor's Overhead, they shall be explicitly identified as related party transactions and shall not exceed amounts that would be incurred in an arms-length transaction for the provision of the same or similar goods and services. If such transactions exist and the amounts paid by the Contractor and included in Overhead are in excess of that which would normally be expended in an arms-length transaction, an adjustment, in the form of a reduction in the amount for calculation purposes, shall be included in any calculation in determining the amount of Allocable Overhead.

Overhead shall not include any cost directly attributable to a particular project. If a cost can be traced to a particular Contract, the Contractor may not classify the cost as Overhead.

Indirect or home office costs that vary substantially with the amount of Work performed shall not be included in the group of costs comprising Overhead.

Overhead shall not include costs specifically disallowed by Federal Acquisition Regulations, Subpart 31.2 – Contracts with Commercial Organizations, or its successor. Further, "Overhead" shall not include the costs of "field support services" that are more closely direct costs in nature, regardless of the manner in which the Contractor normally accounts for such costs. An example of such disallowed cost would be for material handling and expediting, which are costs incurred for the direct support and benefit of specific project(s).

In addition to compliance with Federal Acquisition Regulations, Subpart 31.2 examples of specific costs not allowed in a calculation under this section of the Contract include, but are not limited to, Incentive Compensation paid to personnel classified as Overhead and otherwise includable under this section of Contract, travel and business meetings, employer paid benefits

and taxes on direct payroll costs of any project, insurance costs directly identifiable to a specific project, penalties, and costs incurred regarding company owned equipment normally classified as a direct project costs.

Owner: The City of Everett, Washington. "Owner" and the "City" mean the same.

Owner's Representative: The person designated in writing and employed or retained by the Owner to act as its representative at the construction Site and to perform construction inspection service and administrative functions relating to this Contract. The terms “Owner’s Representative”, “Engineer” and “Architect” are interchangeable.

Person: Includes individuals, associations, firms, companies, corporations, partnerships, and joint ventures.

Physical Completion: Physical Completion Date is the day all of the Work is physically completed on the Project. All documentation required by the Contract and required by law does not necessarily need to be furnished by the Contractor by this date.

Progress Schedule: A schedule prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Time.

Project: The undertaking to be performed under the provisions of the Contract.

Punch List: List of incomplete items of Work and of items of Work that are not in conformance with the Contract Documents, prepared after Substantial Completion.

Reference Information: Information provided to the Contractor by the City that is not part of the Contract.

RCW: Means the Revised Code of Washington.

Samples: Physical examples of materials, Equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

Schedule of Values: Allocation of Contract Sum to items of Work as provided in **9.1.1. Schedule of Values**.

Shall: Required conduct.

Shop Drawings: All drawings, diagrams, illustrations, schedules, and other data or information, which are specifically prepared or assembled by or for Contractor and submitted by Contractor, to illustrate some portion of the Work.

Shown: Refers to information presented on the Drawings, with or without reference to the Drawings.

Site: Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner that are designated for the use of Contractor.

Specifications: That part of the Contract Documents consisting of written descriptions of the technical features of materials, Equipment, construction systems, standards, and workmanship.

Specify: Refers to information described, shown, noted or presented in any manner in any part of the Contract Documents.

Subcontractor: An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

Submittals: The information required by the Contract Documents provided by Contractor to the Owner’s Representative or Owner.

Substantial Completion: The day on which the Owner or Owner's Representative determines the Owner has full and unrestricted use and benefit of the Project, from both the operational and safety standpoints and only minor incidental Work, replacement of temporary substitute facilities, or minor correction or repair Work remains. Determination of Substantial Completion in whole or in part is solely at the discretion of the Owner. Substantial Completion does not mean complete in accordance with the Contract nor shall Substantial Completion of all or any part of the Project entitle the Contractor to Final Acceptance under the Contract.

Supplier: A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or Equipment to be incorporated in the Work.

Total Float: The amount of time any given activity or path of activities may be delayed before it will affect the Completion Date.

Traffic: Both vehicular and non-vehicular traffic, such as pedestrians, bicyclists, wheelchairs, and equestrian traffic.

Unabsorbed Overhead: The reduction or loss of contribution to recovery of the Contractor's Overhead costs realized by the result of reduced Project or Contractor billings, or both, due to any reason whatsoever, including a Project extension.

Unit Price Work: Refers to items of Work identified by unit prices in the Bid form.

Work: Refers to the Project and the provision of all labor, materials, Equipment, supplies, services, and other items necessary for the execution, completion and fulfillment of the Contract.

1.2. CONTRACT DOCUMENTS

The complete Contract includes the following, which are Contract Documents:

1. Federal and state requirements that apply to this Contract and Project;
2. Supplemental agreements between Owner and Contractor, if any, subsequent to the Owner's execution of the Contract and signed by the Mayor of the City of Everett for Owner and by an authorized representative of Contractor;
3. Change Orders;
4. Addenda;
5. The Contract;
6. Bid Form;
7. Specifications, including, but not limited to, these General Conditions and other numbered Documents and Sections;
8. Supplementary Conditions, if any;
9. Drawings and plans;
10. City of Everett standard plans in effect as of the date Bids are opened;
11. Notice to Bidders/Instructions to Bidders; and
12. Certifications and affidavits as required by this Contract and by law.

Any inconsistency in the parts of the Contract shall be resolved by following this order of precedence in the list above (e.g., 1 presiding over 2, 3, 4, 5, and 6; 2 presiding over 3, 4, 5, and 6; and so forth). This order of precedence shall not apply when Work is required by one part of the Contract but omitted from another part or parts of the Contract. The Work required in one part must be furnished even if not mentioned in other parts of the Contract.

These parts complement each other in describing the complete Work. Any requirement in one part binds as if stated in all parts. The Contractor shall provide any work or materials clearly implied in the Contract even if the Contract does not mention it specifically. Any inconsistency in the parts of the Contract shall be referred to the Owner's Representative attention for a determination of the intended requirements.

The Work required in one part must be furnished even if not mentioned in other parts of the Contract. If any part of the Contract requires Work that does not include a description for how the Work is to be performed, the Work shall be performed in accordance with standard trade practice(s). For purposes of the Contract, a standard trade practice is one having such regularity of observance in the trade as to justify an expectation that the Contractor will follow or observe the practice in performing the Work. In case of any ambiguity, disagreement or Dispute over interpreting the Contract, the Owner's Representative's decision will be final as provided in these General Conditions.

Approved Shop Drawings, other Contractor's Submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

2. SPECIFICATIONS AND DRAWINGS

2.1. INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

The Specifications and Drawings are intended to be explanatory and supportive of each other. Work specified on the Drawings and not in the Specifications, or vice versa, shall be executed as if specified in both. In the event the Work to be done or matters relative thereto are not sufficiently detailed or explained in the Contract Documents, the Contractor shall immediately ask the Owner's Representative for further explanation and shall comply with such explanation. In the event of doubt or question arising respecting the true meaning of the Specifications or Drawings, Contractor shall refer to the Owner's Representative for his or her decision.

The Specifications may vary in form, format and style. Some specification sections are written in varying degrees of streamlined or declarative style and some sections may be relatively narrative by comparison. Omissions of such words and phrases as "the Contractor shall," "in conformity with," "as shown," or "as specified" are intentional in streamlined sections. Omitted words and phrases shall be supplied by inference. Similar types of provisions may appear in various parts of a section or articles within a part depending on the format of the section. The Contractor shall not take advantage of any variation of form, format or style in making claims for extra Work.

The cross referencing of specification sections under the subparagraph heading "Related Sections include but are not necessarily limited to:" and elsewhere within each specification section is provided as an aid and convenience to the Contractor. The Contractor shall not rely on the cross referencing provided and shall be responsible to coordinate the entire Work under the Contract Documents and provide a complete Project whether or not the cross referencing is provided in each section or whether or not the cross referencing is complete.

Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

No provision of a standard, specification, manual or code, or an instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Owner's Representative, or their Subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to

Owner, or Owner's Representative, or their related entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

2.2. DIVISION OF SPECIFICATIONS AND DRAWINGS

Specifications and Drawings are divided into groups for convenience. These divisions are not for the purpose of apportioning Work or responsibility for Work among Subcontractors, Suppliers and manufacturers. The Contractor is responsible for all Work shown or described, regardless of location(s) in the Contract Documents.

2.3. DISCREPANCIES IN SPECIFICATIONS AND DRAWINGS

2.3.1. Errors and Omissions

If the Contractor, in the course of the Work, becomes aware of any errors or omissions in the Contract Documents or in the Owner's field work, he or she shall immediately inform the Owner's Representative in writing. The Owner's Representative will promptly review the matter and if he or she finds an error or omission has been made, then he or she will determine the corrective actions and advise the Contractor accordingly. If the corrective work associated with an error or omission significantly increases or decreases the amount of Work called for in the Contract, the Owner will issue an appropriate Change Order. After discovery by the Contractor of an error or omission, related work performed by the Contractor shall be done at its risk unless authorized by the Owner's Representative and approved by the Owner. Omissions from the Drawings or Specifications or the misdescription of details of Work that are manifestly necessary to carry out the intent of the Drawings and Specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the Work, but they shall be performed as if fully and correctly set forth and described in the Drawings and Specifications.

2.3.2. Conflicting Provisions

Figure dimensions on drawings shall govern over scale dimensions and detail drawings shall govern over general drawings. In the event an item of Work is described differently in two or more locations on the Drawings and in the Specifications, the Contractor shall, upon request of the Owner's Representative, submit in writing to the Owner's Representative the description upon which the Contractor relied in preparing its Bid or laying out the Work. If the Owner's Representative directs the Contractor to perform Work in a manner other than that contemplated by the Contractor in preparing its Bid or laying out the Work, Change Order procedures will be followed. In this event, the Contractor shall submit to the Owner's Representative such supporting information, including bidding or layout documents, as may reasonably be necessary for the Owner's Representative to determine whether the Contract Sum is increased, decreased or unchanged by the Change Order.

2.3.3. Utilities

2.3.3.1 General

The Owner has endeavored to determine the existence of utilities at the Site of the Work from the records of the owners of known utilities in the vicinity of the Work. The positions of these utilities as derived from such records are shown on the Drawings. No excavations were made to verify the locations shown for underground utilities. The service connections to these utilities are not shown on the Drawings. It shall be the responsibility of the Contractor to determine the exact location of utilities and service connections thereto. Such field verification must be performed in sufficient time so as not to impede the progress of the Work or fabrication of materials to be incorporated into the Work. The Contractor shall call the Utility Location Request Center (one call center) for location of utilities in the field not less than two (2) nor more than (10) ten business days before the scheduled date of commencement of excavation. The Contractor shall

make its own investigations, including exploratory excavations, to determine the locations and type of existing utilities, including service connections, prior to commencing work that could result in damage to such utilities. The Contractor shall immediately notify the Owner's Representative as to any utility discovered by him in a different position than shown on the Drawings or which is not shown on the Drawings. No excavation shall begin until all known facilities in the excavation areas have been marked. Contractor shall coordinate its activities with the utility provider. Contractor shall bear the cost of maintaining utility service.

The Contractor should be aware of, and comply with, Chapter 19.122 RCW, a law relating to underground utilities. The Owner shall not pay Contractor any of Contractor's cost of complying with this law, or repairing or indemnifying any damage or injury arising out of Contractor's failure to comply with this law.

Owner does not represent or warrant who may be obligated to pay for the cost of relocation or temporary maintenance of the utility. Contractor shall investigate whether such cost must be borne by the owner of the utility.

Governmental agencies and owners of utilities reserve the right to enter upon streets, alleys, rights-of-way, or easements for the purpose of making changes in their property made necessary by the Work and for the purpose of maintaining and making repairs to their property.

2.3.3.2 Known Utilities

The Contractor shall provide at its sole expense all labor, equipment, materials and services necessary to remove, relocate, or maintain utilities specified on the Drawings. The work on each utility shall be performed in a manner satisfactory to the utility owner. The utility owner has the option of doing such work with its own forces at the Contractor's expense, or permitting the work to be performed by the Contractor.

2.3.3.3 Service Connections

Locations of service connections are not identified on the Drawings. The Contractor shall provide at its sole expense all labor, equipment and material to remove, relocate or maintain service connections. Work on service connections shall be performed in a manner satisfactory to the service connection owner. The service connection owner has the option of doing such work with its own force at the Contractor's expense, or permitting the work to be performed by the Contractor.

2.3.3.4 Unknown Utilities

When a utility interferes with the Work and is either (1) not identified on the Drawings or (2) located in a position significantly different from that specified on the Drawings, Contractor shall follow the procedures of **ARTICLE 11. DIFFERING SITE CONDITIONS**. Interference with the Work is defined as a utility that crosses or projects into the plane of the Work at an elevation between the top and bottom of the Work. If it is necessary to remove, relocate, or temporarily maintain the utility, that work shall be included in a Change Order. The utility owner has the option of doing such work or permitting the work to be performed by the Contractor. In either case, the cost of the work incurred by or charged to the Contractor will be included in a Change Order.

2.4. SUBMITTALS

Where required by the Contract Documents, the Contractor shall submit information which will enable the Owner's Representative to advise the Owner whether the Contractor's proposed materials, Equipment or methods of work are in general conformance to the design concept and in compliance with the Drawings and Specifications, such as catalog cuts and shop, working or detail drawings. In its Submittals, the Contractor shall expressly and explicitly notify the Owner's Representative of any and all deviations from the Specifications. Without express and explicit Notice of a deviation from the Contract requirements, approval of a Submittal does not relieve

Contractor from complying with Contract requirements. The Owner's approval of a Submittal does not constitute a waiver of the Contract requirements. The Owner or Owner's Representative shall respond to a Submittal within thirty (30) days of receipt. The Owner or Owner's Representative may extend this time for good cause by notifying the Contractor. The Owner will not be obligated to accept or pay for Work performed by the Contractor that may be affected by materials, Equipment, or methods of work not submitted in a timely manner so that final review can be accomplished before the affected Work is complete. The Owner shall not be responsible for Delays, inefficiencies, or any additional costs or expenses caused in whole or in part by Contractor's failure to submit required information in sufficient time for review, comment, and correction. Contractor's failure to submit required information in sufficient time for review, comment and correction shall be deemed a waiver of any and all Contract Claims for adjustment of Contract Sum or Contract Time arising out of, or related to, such a Submittal. Contractor acknowledges and agrees that it may not rely upon receiving the Owner's response to a Submittal in less than thirty (30) days, unless the Owner explicitly changes this section by a signed Change Order. Requests for information or clarification from the Contractor to the Owner shall be treated as a Submittal.

2.5. CONTRACTOR'S COPIES OF CONTRACT DOCUMENTS

The Contractor shall keep at the construction site at least one set of Contract Documents and one set of full-size Drawings that shall be available to the Owner's Representative and Owner.

3. OWNER

3.1. GENERAL

The Owner, and the Owner's Representative, shall have the authority to act as the sole judge of the Work, Equipment and materials with respect to both quantity and quality as set forth in the Contract. It is expressly stipulated that the Drawings, Specifications and other Contract Documents set forth the requirements as to the nature of the completed Work and do not purport to control the method of performing Work except in those instances where the nature of the completed Work is dependent on the method of performance.

The Owner has the authority to act, do, perform, and make any all decisions and actions authorized by the Contract Documents, including, but not limited to, Change Orders, progress payments, Contract decisions, acceptability of the Contractor's Work, and early possession. The Owner has the authority to accept or reject requests for progress payments that have been submitted by the Contractor and recommended by the Owner's Representative. The Owner has the authority to make determinations of the acceptability of the Work. The Owner also has the authority to accept or reject the Owner's Representative's recommendations regarding retention of defective Work.

3.2. OWNER'S REPRESENTATIVE

The Owner's Representative shall be satisfied that all the Work is being done in accordance with the requirements of the Contract. The Contract and Specifications give the Owner's Representative authority over the administration of the Contract. Whenever it is so provided in this Contract, the decision of the Owner's Representative shall be final.

The Owner's Representative's decisions will be final on all questions including but not limited to, unless specifically assigned to an Architect or Engineer, the following:

1. Measurement of Work, whether lump sum, Force Account, or unit price;
2. Acceptability of rates of progress on the Work;
3. Interpretation of Drawings and Specifications with regard to administrative matters;

4. Determination as to the existence of changed or differing site conditions;
5. Fulfillment of the Contract by the Contractor;
6. Payments under the Contract including adjustment and;
7. Suspension(s) of Work.

If the Contractor fails to respond promptly to the requirements of the Contract or orders from the Owner's Representative:

1. The Owner's Representative may use the Owner's resources, other contractors, or other means to accomplish the Work, and
2. The Owner will not be obligated to pay the Contractor, and will deduct from the Contractor's payments, any costs that result when any other means are used to carry out the Contract requirements or Owner's Representative's orders.

At the Contractor's risk, the Owner's Representative may suspend all or part of the Work if:

1. The Contractor fails to fulfill Contract terms, to carry out the Owner's Representative's orders, or to correct unsafe conditions of any nature; or
2. It is in the public interest.

The Owner's Representative and Owner shall have complete access to the Work and to the Site of the Work and to the places where Work is being prepared or where materials, Equipment, and machinery are being obtained for the Work. If requested by the Owner's Representative or Owner, the Contractor shall provide the assistance necessary for obtaining such access, and shall provide information related to the inspection of construction. Absence of such access or information, as needed, may result in the Owner's refusal to accept the Work.

The Owner's Representative has the authority to recommend Change Orders, but does not have authority to approve Change Orders. Proposed Change Orders are subject to review and approval by the Owner. No proposed Change Order or any change of Contract Sum or Contract Time is effective or binding upon the Owner unless and until the Mayor or his or her designee signs it, as authorized by City Council or by ordinance.

To detail and illustrate the Work, the Owner's Representative may furnish to the Contractor additional Drawings and explanations consistent with the original Drawings. The Contractor shall perform the Work according to these additional Drawings and explanations.

The Owner's Representative may appoint assistants and inspectors to assist in determining that the Work and materials meet the Contract requirements. Assistants and inspectors have the authority to reject defective material and suspend Work that is being done improperly, subject to the final decisions of the Owner's Representative or, when appropriate, the Owner.

Assistants and inspectors are not authorized to accept work, to accept materials, to issue instructions, or to give advice that is contrary to the Contract. Work done or material furnished which does not meet the Contract requirements shall be at the Contractor's risk and shall not be a basis for a Contract Claim even if the Owner's Representative, inspectors or assistants purport to change the Contract.

Assistants and inspectors may advise the Contractor of faulty Work or materials or infringements of the terms of the Contract; however, failure of the Owner's Representative or the assistants or inspectors to advise the Contractor does not constitute acceptance or approval.

The Contractor shall submit supplemental working or detail drawings as required for the performance of the Work pursuant to **2.4. SUBMITTALS**. Except as noted, all drawings and other Submittals shall be delivered directly to the Owner's Representative. The drawings shall

be on sheets measuring 22 by 34 inches, 11 by 17 inches, on sheets with dimensions in multiples of 8 1 /2 by 11 inches, or other size approved by the Owner consistent with the Work to be detailed. Contractor shall provide drawings far enough in advance of ordering or installation to allow for review by the Owner's Representative or other agencies and possible resubmittal and further review after resubmittal. After a plan or drawing has been reviewed and returned to the Contractor, all changes proposed by the Contractor may be submitted to the Owner's Representative for review and comment.

The Contractor shall obtain the Owner's Representative's written acknowledgement of approved Submittals before proceeding with the Work represented by the Submittal. Such review does not impose any responsibility upon the Owner, nor does it relieve the Contractor of any responsibility for the accuracy of the Submittal or its conformity with the Contract. The Contractor shall bear all risk and all costs of any Work delays caused by resubmittal or correction of Submittals. The Contractor shall allow sufficient time for Owner's review of Submittals and possible corrections by the Contractor so as not to delay the Work.

The Contractor's Bid price shall include all costs of all Submittals, including, but not limited to, working, detail and shop drawings.

4. CONTRACTOR

4.1. CONTRACTOR'S REPRESENTATIVE

The Contractor shall notify the Owner in writing of the name of the person who will act as the Contractor's representative and shall have the authority to act in matters relating to this Contract. This person shall have authority to carry out the provisions of the Contract and to supply materials, Equipment, tools and labor without delay for the performance of the Work.

Contractor shall employ and keep on Site on a full time basis personnel experienced in the management of construction of projects of this size and type. These shall include, but not be limited to, a project manager and superintendent. Neither the Contractor's project manager nor the superintendent shall have supervisory responsibility for other Projects for the Contractor while assigned to this Project. Contractor shall employ and assign such additional, full time office, support and engineering personnel to support the project manager and superintendent and allow timely completion of the Project. The project manager and superintendent shall be approved by the Owner, and such approval shall not be unreasonably withheld. Contractor acknowledges that one of the instances in which it will be reasonable for the Owner to withhold consent is if the project manager or superintendent is different than as stated in the Bidder Qualification Statement. Contractor shall submit personnel qualifications within ten (10) days of Contractor's execution of the Contract. Bases for disapproval include, but are not limited to, lack of sufficient experience managing the construction of similar type or size projects or relationships on other projects unsatisfactory to the Owner. Owner may require removal and replacement of Contractor's supervisory staff who are disruptive or who appear to lack sufficient competence to complete the Project successfully.

4.2. CONSTRUCTION PROCEDURES

The Contractor shall supervise and direct the Work and determine the means, methods, techniques, sequences and procedures of construction, except in those instances where the Owner, to define the quality of an item of Work, specifies in the Contract, a means, method, technique, sequence or procedure for construction of that item of Work.

4.3. SUBCONTRACTORS

Unless explicitly specified elsewhere in the Contract Documents or expressly authorized in writing by the Owner before Contractor submits its Bid, the Contractor shall perform with its own

organization at least one-third of the Work by dollar volume and Contractor shall not sublet to a single Subcontractor more than one-half of the Project. A Subcontractor of the Contractor shall not sublet to another Subcontractor more than one-half of its work without the written consent of the Owner obtained within twenty (20) days of award of the Contract to the Contractor. The Owner may refuse to approve such subcontract for any reason. Only unit price and Schedule of Value items of the Contract will be used in computing the total Work. The Owner may, at its sole option, refuse to approve a Subcontractor that is also providing services to the Owner on the same project.

Subcontractors will be considered agents of the Contractor and their work shall be subject to the provisions of the Contract. References in the Contract Documents to actions required of Subcontractors, manufacturers, Suppliers, or persons other than the Contractor, the Owner or the Owner's Representative shall be interpreted as requiring that the Contractor shall require such Subcontractor, manufacturer, Supplier or Person to perform the specified action.

Contractor shall comply with RCW 39.04.250 and RCW 39.76.011, as amended, and any successor and other laws, ordinances, and regulations regarding payment of Subcontractors. Contractor shall also comply with the requirements of RCW Chap. 60.28 and any other law, ordinance, or regulation relating to the release of retainage to Subcontractors.

The Contractor shall specifically include in each of its first tier subcontracts the language in this section with regard to the Subcontractor’s obligation to meet bidder responsibility criteria, and shall require each of its Subcontractors to include substantially the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. The requirements of this section apply to all Subcontractors regardless of tier.

At the time of subcontract execution, the Contractor must verify that each of its first tier subcontracts meets the following bidder responsibility criteria:

1. At the time of subcontract Bid Submittal, have a certificate of registration in compliance with Chapter 18.27 RCW;
2. Have a current state unified business identifier number;
3. If applicable, have:
    a. Industrial insurance coverage for the Subcontractor’s employees working in Washington as required in Title 51 RCW;
    b. An employment security department number as required in Title 50 RCW;
    c. A state excise tax registration number as required in Title 82 RCW;
    d. An electrical contractor license, if required by Chapter 19.28 RCW;
    e. An elevator contractor license, if required by Chapter 70.87 RCW.
4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3).
5. If bidding on a public works project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the bid solicitation;
6. Within the three-year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the department of labor and industries or through a civil judgment entered by a court of

limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW; and

7. Have received training on the requirements related to public works and prevailing wage under in accordance with the requirements of RCW 39.04.350(f), or demonstrate exemption from such requirements.

The Contract Documents shall apply to Subcontractors and Suppliers as if each had signed the Contract with the Owner. Contractor shall include the provisions of these Contract Documents or a “flow down” clause in each contract with Subcontractors and Suppliers.

4.4. RESPONSIBILITIES

4.4.1. Subcontractors, Manufacturers and Suppliers

The Contractor shall be responsible for the adequacy, efficiency and sufficiency of Subcontractors, manufacturers, Suppliers and their employees.

4.4.2. Contractor's Employees

The Contractor shall be responsible for the adequacy, efficiency and sufficiency of its employees. Workers shall have sufficient knowledge, skill and experience to perform properly the Work assigned to them.

4.4.3. Payment for Labor and Materials

The Contractor shall pay and require its Subcontractors to pay any and all accounts for labor including Worker's Compensation premiums, State Unemployment and Federal Social Security payments and other wage and salary deductions required by law. The Contractor also shall pay and cause its Subcontractors to pay any and all accounts for services, Equipment, and materials used by him and its Subcontractors during the performance of Work under this Contract. The Contractor shall pay such accounts as they become due and payable. If requested by the Owner, the Contractor shall promptly furnish proof of payment of such accounts to the Owner.

4.4.4. Attention to Work

The Contractor, acting through its representative, shall give personal attention to and shall manage the Work so that it shall be prosecuted faithfully and completed under the Project schedule. When its representative is not personally present at the Project Site, its designated alternate shall be available and shall have the authority to act in matters relating to this Contract.

4.4.5. Safety

The Contractor alone shall be responsible for safety on the job Site, including, but not limited to, the safety of its and its Subcontractor's employees. The Contractor shall maintain the Project Site and perform the Work in a manner which meets the Owner's responsibility under statutory and common law for the provision of a safe place to work.

4.4.6. Threats, Intimidation and Harassment Forbidden

Contractor shall not allow its employees, its Subcontractors, its Subcontractors’ employees, or any other agents to threaten bodily injury or property damage, to intimidate or attempt to intimidate any person, or to assault or physically harass any person. Forbidden conduct includes, but is not limited to, threatening, appearing, or actually doing any of the following: pushing, shoving, striking, physically blocking a person or a person’s vehicle, vandalism, malicious mischief, or any other act that a reasonable person would understand be intended to intimidate, cause personal injury, or cause property damage. Contractor shall remove from the job site any person reasonably under its control or direction who the Contractor or Owner reasonably believes violated this section. The lack of a request from the Owner or Owner’s

Representative to the Contractor to remove someone from the job Site does not relieve the Contractor from its obligation to remove someone.

4.4.7. Weapons Forbidden

Contractor shall not allow its employees, its Subcontractors, its Subcontractors' employees, or any other agents or representatives to carry or possess, openly or concealed, explosives or weapons on the job Site, except: (a) such explosives are as reasonably required for performance of the Work, such as those necessary for blasting or demolition work called for by the Contract Documents or (b) commissioned law enforcement officers or security personnel under authority of their commission. A weapon is any object, instrument or chemical which is (1) designed in such a manner to inflict harm or injury to another person; or (2) any item used in a manner threatening harm or injury to another person. Weapons include, but are not limited to, firearms, dangerous knives, dangerous chemicals, tear gas, martial arts weapons, blackjacks or other weapons. Further, weapons should include those delineated in EMC Chapter 10.78. b. Possession of mace, pepper spray or the like for defensive purposes is not a violation of this policy. Contractor shall remove from the job Site any person reasonably under its control or direction who the Contractor or Owner reasonably believes violated this section. The lack of a request from the Owner or Owner's Representative to the Contractor to remove someone from the job Site does not relieve the Contractor from its obligation to remove someone.

4.4.8. Safety Standards

The Contractor shall comply with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by Department of Labor Regulations (29 CFR, Part 5). Under this section, the Contractor shall not require any laborer or mechanic to work in surroundings or under working conditions that are unsanitary, hazardous, or dangerous to its health and safety as determined under construction, safety, and health standards promulgated by the Secretary of Labor. These requirements do not apply to the purchase of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

4.4.9. Public Safety and Convenience

The Contractor shall conduct its work so as to ensure the least possible obstruction to Traffic and inconvenience to the general public, business, organizations and residents in the vicinity of the Work and to reasonably protect persons and property. No roads or street shall be closed to the public except with the permission of the Owner's Representative and the proper governmental authority. Fire hydrants on or adjacent to the Work shall be accessible to fire fighting Equipment. Temporary provisions shall be made by the Contractor for the use of sidewalks, private and public driveways and proper functioning of gutters, sewer inlets, drainage ditches and culverts, irrigation ditches and natural water courses.

4.4.10. Access to Work

Owner, Owner's Representative, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

4.4.11. Emergencies

In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Owner's Representative prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been

caused thereby or are required as a result thereof. If Owner's Representative determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

4.4.12. Trench Excavation

For all trench excavations that exceed a depth of four feet, the Contractor must use adequate safety systems that meet the requirements of the Washington Industrial Safety and Health Act, chapter 49.17 RCW.

4.4.13 `COVID-19 Requirements

The Contractor shall be in compliance at all times with all governmental laws, regulations, requirements, and orders relating to COVID-19 applicable to the Work, including without limitation OSHA, L&I or other safety rules relating to COVID-19 and COVID-19 gubernatorial proclamations and orders. These laws, regulations, requirements, and orders are referred to as "COVID-19 Requirements."

Contractor's Bid includes all costs necessary for the duration of the Work for compliance with COVID-19 Requirements. Contractor's Bid takes into account that COVID-19 Requirements may create direct and indirect costs, including inefficiency and delay.

Contractor shall have no entitlement to an adjustment or other increase to the Contract Sum for any direct or indirect costs (including without limitation delay, cumulative impact, inefficiency or ripple costs) incurred by the Contractor to comply with COVID-19 Requirements.

4.5. OWNER-CONTRACTOR COORDINATION

4.5.1. Service of Notice

Contractor agrees that any Notice, order, direction, request or other communication by the Owner's Representative or Owner to the Contractor shall be deemed received by the Contractor if left at any office used by the Contractor or delivered to any of the Contractor's officers, clerks or employees or posted at the site of the Work or mailed to any post office addressed to the Contractor at the address given in the Contract Documents or mailed to the Contractor's last known place of business. If mailed, any form of communication will be deemed to have been given to and received by the Contractor the day after the day of mailing.

4.5.2. Suggestions to Contractor

Nothing in these Contract Documents requires the Owner's Representative to provide the Contractor with direction or advice on how to do the Work, construction practices, or means and methods. If the Owner's Representative approves, suggests or recommends any construction practice, means, method or manner for doing the Work or producing materials, the approval or recommendation shall not: (A) guarantee that following the method or manner will result in compliance with the Contract Documents; (B) relieve the Contractor of any risks or obligations under the Contract Documents; or (C) create any liability by the Owner to the Contractor.

Suggestions as to the plans or methods of accomplishing the Work or Contract requirements by the Owner or the Owner's Representative to the Contractor but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor. The Owner and the Owner's Representative assume no responsibility therefor and in no way will be held liable for any defects in the Work which may result from or be caused by use of such plan or method or Work.

4.5.3 Meetings with Owner

The Contractor shall have its duly authorized representative attend periodic informational meetings with the Owner's Representative and City staff, as reasonably required by the Owner.

Contractor, Owner, and Owner's Representative shall meet as often as determined by the Owner's Representative, but no less often than once each month. The purpose of the meeting is to review Project status in relation to the construction schedule; review value of Work completed during the previous month; and, if applicable, review Contractor's plans to return Project status to that required by the schedule. If requested by the Owner or Owner's Representative, the Contractor shall submit a written progress report within five (5) days following this meeting, comprising:

1. The current construction schedule indicating percent complete, actual completion or start dates since the previous review, the estimated remaining duration for each activity in progress, Schedule of Values update, and narrative summary.
2. Reasons any activities are behind schedule and the corrective steps being taken.

4.5.4. Cooperation with Others

The Contractor agrees to permit entry to the Site of the Work by the Owner, its employees or other contractors performing work on behalf of the Owner. The Contractor shall afford to the Owner, other contractors and their employees, reasonable facilities and cooperation and shall arrange its work and dispose of its materials in such a manner as to not interfere with the activities of the Owner or of others upon the Site of Work. The Contractor shall promptly make good any Contractor-caused injury or damage to persons or property that may be sustained by other contractors or employees of the Owner. The Contractor shall join its work to that of others and perform its work in proper sequence in relation to that of others.

If requested by the Contractor, the Owner will arrange meetings with other contractors performing work on behalf of the Owner to plan coordination of construction activities. The Contractor shall inform itself of the planned activities of other contractors and will coordinate its work with the other contractors.

Contractor shall notify the Owner of problems, interference or any difficulty with other contractors or workers engaged by the Owner. The Notice shall be sufficiently prompt and specific so as to allow the Owner to mitigate or avoid increased costs, time of performance, damages or injury. Contractor's failure to provide such Notice in a timely way shall be deemed a waiver and release of any and all Contract Claims relating to, arising out of, or caused by, any alleged interference, difficulty or problem with another contractor or worker engaged by the Owner.

5. PROGRESS AND COMPLETION

5.1. NOTICE TO PROCEED

Following execution of the Contract by the Owner, the Owner or Owner's Representative will give the Contractor a written Notice to Proceed. Notwithstanding other provisions of the Contract, the Contractor shall not be obligated to perform Work, and the Owner will not be obligated to accept or pay for Work performed by the Contractor or be liable for any Delays, prior to delivery of the Notice to Proceed. The Owner's knowledge of Work being performed prior to delivery of the Notice to Proceed will not obligate the Owner to accept or pay for such Work. Contractor waives any and all Contract Claims for an adjustment of Contract Sum and Contract Time arising out of, or related to, work it performs prior to receipt of the Notice to Proceed. The Owner may issue partial Notices to Proceed.

5.2. CONTRACT TIME

5.2.1. General

TIME IS OF THE ESSENCE IN PERFORMING THE CONTRACT. Failure to complete the Project within the contractually specified time may affect other Projects and Owner activities.

Contract Time starts upon the later of the issuance of the Notice to Proceed or a date specified in the Notice to Proceed. The Contractor shall promptly start the Work as soon as possible after the date of the Notice to Proceed and shall prosecute the Work so that the various portions of the Project shall be completed in accordance with the Contract Time period. Contractor shall perform its work at such times and in such ways that the Work is not damaged by weather such as wind, rain, or snow. Contractor shall correct or repair at its sole expense any Work damaged by weather, irrespective of whether such damage is covered by insurance. No portions of the Work where acceptable quality will be affected shall be constructed while unfavorable conditions exist. By bidding on the Project and executing a Contract to perform the Work, Contractor agrees the contractually required completion dates are feasible, reasonable, and achievable for the Contract Sum. Contractor represents that it has considered all factors relevant to its price and achieving the Completion Dates, including, but not limited to, weather, Site access, labor conditions and the availability of materials, supplies and Equipment. Compliance with **ARTICLE 10. NOTICE TO OWNER**, **ARTICLE 12. CONTRACT CLAIMS**, and **5.2.2. Construction Schedule** are conditions precedent to a request for, consideration of, and grant of, any extension of Contract Time. Failure to request a time extension in the manner and in the time required by this section, and the Specifications referred to herein, constitutes a waiver by the Contractor of any and all entitlement to an extension of time and any adjustment of Contract Sum arising out, or related to, such Delay.

5.2.2. Construction Schedule

5.2.2.1 General

Contractor shall submit, update and maintain schedules as required by the Contract Documents.

The Contractor shall provide sufficient material, equipment, and labor to meet the interim milestones, Substantial Completion, Physical Completion and Completion Dates provided by the Contract Documents. The Owner allocates its resources to a Contract based on the total time allowed in the Contract. The Contractor may submit a schedule indicating Completion Date earlier than the end of Contract Time, but Owner cannot guarantee its resources will be available to meet such schedule. Owner shall not pay or be liable for any additional compensation if the Contractor is not able to meet a schedule that indicates a Completion Date earlier than the end of Contract Time.

Failure to schedule Owner furnished or installed materials and Equipment for installation on or after its planned arrival pursuant to the Owner's contract with the supplier or failure to Notify the Owner of tasks dependent upon the fact or date of arrival of such Owner furnished materials and Equipment, constitute a waiver by Contractor of any Contract Claim arising out of or related to the timeliness of the furnishing or installation of such material and Equipment. All schedules must allow for timely incorporation of any other's work under separate contract with Owner and for timely incorporation of work provided and installed by Owner. Unless otherwise expressly authorized in writing by the Owner's Representative, the Contractor must integrate the schedules with the Schedule of Values and unit price items so that each construction activity is represented by a dollar value.

Float in a Progress Schedule belongs to the Owner.

Subcontractors shall review all schedules prior to submission to the Owner and Owner's Representative. At the Owner's option and sole discretion, Owner may require Contractor to obtain written acceptance of each schedule by Subcontractors as practical and feasible, as the schedule relates to Subcontractors' work.

Contractor shall not schedule any activity with an unrealistic, unduly long, or unduly short duration. Contractor shall use its best efforts in good faith to set reasonable durations for all

activities. Contractor shall not attempt to “grab the Float” or make any effort to use any Float in the Progress Schedule for the benefit of the Contractor.

Contractor shall submit with each Application for Payment or progress pay estimate an updated Progress Schedule, but no less often than monthly. If requested by the Owner’s Representative or the Owner, Contractor shall prepare and submit updated Progress Schedules from time to time, which may be more frequent than monthly.

The Contractor hereby expressly agrees and acknowledges that any failure by Contractor to provide accurate, complete, current and updated schedules with each and every progress pay estimate or Application for Payment constitutes a waiver of any and all claims or requests for adjustment of Contract Sum or Time that arise out of, result from, or are caused by, any Delay on the Project or scheduling of the Work. Timely submission of monthly updated schedules is a condition precedent to any later or subsequent Contract Claim or request for an adjustment of either Contract Sum or Time related to or arising out of time, an alleged Delay, or the schedule or sequence of Work. Similarly, the parties agree the Owner may withhold progress pay estimates if updated schedules are not timely submitted. These remedies are cumulative and not exclusive of any other remedy. The Owner’s use of one or more of these remedies does not constitute an election or prevent the Owner from pursuing other remedies for this or other defaults.

The Owner’s Representative’s review of any schedule shall not transfer any of the Contractor’s responsibilities to the Owner. The Contractor alone shall remain responsible for adjusting forces, equipment, and work schedules to ensure completion of the Work within the Contract Time. Review by the Owner or Owner’s Representative shall not constitute approval or acceptance of the Contractor's construction means, methods, sequencing, logic, order, precedence and succession of activities or Contractor’s ability to complete the Work in a timely manner. Any mistakes or errors in any schedule, including, but not limited to, mistakes or errors of logic, order, precedence, and duration, are and remain the Contractor's. The Owner or Owner’s Representative may comment upon the schedule.

5.2.2.2 Extensions of Contract Time

Any requests for extensions in Contract Time, whether resulting from Extra Work directed by the Owner or not, shall be accompanied by an analysis of schedules using the critical path method. This analysis shall include an updated schedule, an as-planned schedule, an as-built schedule, a but-for schedule, and narrative explaining the alleged causes, schedule impacts and all costs related to or arising out of the proposed extension. Any requests for extensions of Contract Time by the Contractor shall be submitted in accordance with these General Conditions. Extensions of Contract Time will be granted only as provided in the General Conditions and to the extent that affected critical activities exceed the Total Float time along the affected paths of the reviewed Preliminary Schedule at the time the change was authorized in writing by the Owner. Contractor has the burden of clearly and convincingly demonstrating entitlement to any adjustment of Contract Time.

If the Owner is solely responsible for any Delay to Substantial Completion, Physical Completion, Completion Date, or Final Acceptance, the Contractor shall only be entitled to compensation or other damages as described in **12.4 REMEDIES**, provided that Contractor timely gave Notice pursuant to **ARTICLE 10. NOTICE TO OWNER**, timely submitted a Contract Claim pursuant to **ARTICLE 12. CONTRACT CLAIMS** and fulfilled the requirements of **5.2.2. Construction Schedule**.

5.2.3. Construction Progress

The Contractor shall furnish all labor, materials, facilities and Equipment necessary to insure the prosecution and completion of the Project within the interim milestones, Substantial Completion, Physical Completion and Completion Dates of the Contract. If Work falls seven (7) days or more

behind the reviewed Preliminary Schedule, the Contractor agrees that, at its sole cost and expense, it will take all actions necessary to return the Project to the accepted schedule. These actions may include the following:

1. Increase labor in quantities and crafts.
2. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of Equipment, or any combination of the foregoing.
3. Reschedule activities.

If requested by the Owner's Representative, the Contractor shall prepare a proposed schedule revision demonstrating a plan to make up the lag in progress and insure completion of the Work within the Contract Time. All actions taken to return the Project to the accepted schedule are at the Contractor's expense.

The Contractor shall pay all costs incurred by the Owner that result from the Contractor's action to return the Project to its accepted schedule, including, but not limited to, additional, overtime, or third party inspection, design and construction management service costs. Contractor agrees that Owner shall deduct such charges from payments due the Contractor. It is further understood and agreed that none of the services performed by the Owner's Representative in monitoring, reviewing and reporting Project status and progress shall relieve the Contractor of responsibility for planning and managing construction Work in conformance with the construction schedule.

5.2.4. Delays

5.2.4.1 General

In the event of a Delay, the Contractor shall take immediate steps to minimize the Delay or avoid further Delay. The Contractor agrees it shall not make any Contract Claim or request for adjustment of Contract Time or Contract Sum based upon Delays for which it did not timely provide Notice to the Owner.

5.2.4.2 Bonuses

If the Contract Documents provide the Contractor with a bonus or other incentive for early completion of a milestone or other completion point, Contractor assumes the risk of Delays caused wholly or partially by third parties. Owner shall not pay any bonus that Contractor would have achieved but for any and all Delays caused in whole or in part by a third party. By way of example only, the Contractor bears the risk of utility companies' failure to locate underground utilities accurately and the Contractor bears the risk of timely asking for the marking of the location of underground utilities.

5.3. SUSPENSION PROCEDURES

The Owner may, at its convenience and at any time and without cause, suspend all or any part of the Work by notice in writing to the Contractor. The Work shall be resumed by the Contractor within five (5) days after receiving written notice from the Owner to do so. The Contractor will be allowed an increase in the Contract Sum or an extension of Contract Time, or both, directly attributable to any suspension in accordance with the Change Order procedures herein; provided, (1) the Contractor shall not be entitled to any increase to the extent caused by the Contractor and (2) Contract Sum increases and Contract Time extensions for suspension caused by Third Parties or Force Majeure Events are limited as set forth in **12.4.3.4 Third Party Caused Delays and Force Majeure**.

5.4. TERMINATION PROCEDURES

5.4.1. Termination by Owner for Default

The Owner may terminate the Contract upon written notice to Contractor and its surety whenever the Contractor is deemed to be in default or fails to fulfill, in a timely and proper manner, one or more Contract obligations, or is in violation of any provisions or covenants of the Contract. Termination shall be effective upon receipt of such notice by the Contractor.

For purposes of this paragraph, the Contractor shall be deemed to be in default upon the occurrence of any one or more of the following events:

1. If Contractor is bankrupt or insolvent.
2. If Contractor makes a general assignment for the benefit of creditors.
3. If a trustee or receiver is appointed for Contractor, or for any of Contractor's property.
4. If Contractor files a petition to take advantage of any debtor's law, or to reorganize under any bankruptcy chapter or law.
5. If Contractor repeatedly fails to make prompt payments to Subcontractors or others for labor, materials, or Equipment.
6. If Contractor disregards laws, ordinances, rules, regulations, or orders of any public body having jurisdiction.
7. If Contractor disregards the authority of the Owner or Owner’s Representative.
8. If Contractor violates in a substantial way the provisions of the Contract Documents or fails, neglects, or refuses to proceed in compliance with the provisions of the Contract Documents.
9. If the Contractor made material misrepresentations to the Owner with respect to: (a) its qualifications or those of its Subcontractors; (b) its or its subcontractors’ ability to perform the Work in a timely, workmanlike manner; (c) the materials installed or to be installed; or (d) progress pay estimates.
10. If Contractor fails to supply sufficient skilled workers or suitable materials or equipment.
11. If Contractor refuses or fails to prosecute the Work with such diligence as will ensure its Physical Completion within the original Physical Completion time and any extensions of time which may have been granted to the Contractor by change order or otherwise.
12. If Contractor performs Work which deviates from the Contract.
13. If Contractor otherwise violates in any material way any provisions or requirements of the Contract.

After termination of the Contractor for default, the Owner may transfer performance of the Work to the Contractor's surety. The Owner may exclude the Contractor from the Site and take possession of the Work and all of the Contractor's tools, appliances, owned or rented construction equipment, and machinery at the Site and use the same to the full extent they could be used by the Contractor. The Owner may incorporate in the Work all materials and Equipment stored at the Site or for which the Owner has paid the Contractor, but which are not yet on Site. In such case, the Contractor will not be entitled to receive any further payment until the Work is finished. At the Owner’s sole option, Contractor shall assign and transfer any contractual rights to material and Equipment to be installed, incorporated, or used in the performance of the Work. Owner shall credit Contractor for the reasonable fair market rental value of any and all Contractor owned equipment for so long as retained and used by the Owner. Owner shall credit Contractor for all materials and supplies on Site or on order, but not

yet paid for by Owner, provided that ownership is transferred and assigned to the Owner and the materials and supplies conform to the requirements of the Contract Documents.

If the unpaid balance of the Contract Sum exceeds the direct and indirect cost of the completed Work, including construction management services, such excess shall be paid to the Contractor. If such costs exceed such unpaid balance, the Contractor shall pay the difference to the Owner. Such costs incurred by the Owner will be verified by the Owner's Representative and incorporated into a Change Order, but in finishing the Work, the Owner may negotiate for materials, Equipment and services to complete the Work and will not be required to obtain the lowest figure for Work performed.

Where the Contractor services have been so terminated by the Owner, the termination shall not affect any rights of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment of monies due the Contractor by the Owner will not release the Contractor from liability.

If the Owner terminates this agreement for default, and it is thereafter determined that the Contractor had not so failed to perform its obligations or defaulted in any way, the termination shall then be deemed to have been made for the convenience of the Owner pursuant to **5.4.2 Termination For Convenience**. In that event, any adjustment of Contract Sum shall be in accordance with the General Conditions.

The Contractor covenants and agrees that in the event suit is instituted by the Owner for any default on the part of the Contractor and the Contractor is adjudged by court of competent jurisdiction to be in default, the Contractor shall pay to the Owner all costs, expenses expended or incurred by the Owner in connection therewith.

In exercising the Owner's right to prosecute the Physical Completion of the Work, the Owner shall have the right to exercise its sole discretion as to the manner, method, and reasonableness of the costs of completing the Work. In the event that the Owner takes Bids for remedial Work or Physical Completion of the project, the Contractor shall not be eligible for the Award of such Contracts.

5.4.2. Termination for Convenience

Without prejudice to any other remedy it may have under law or and/or the provisions of the Contract, the Owner may terminate this Contract for convenience, with or without cause, in whole or in part, at any time by giving written notice to the Contractor. Termination will be effective upon receipt of such Notice by the Contractor. The Contractor shall immediately discontinue Work and take all reasonable steps with its suppliers and subcontractors to minimize cancellation charges and other costs.

In the event of termination for convenience, the Contractor shall be compensated as provided in **9.2.3. Deleted Work**. The Contractor will be entitled to no further payments whatsoever for the Work.

In the event of a breach or default by the Contractor, Owner may, at its sole option, terminate this Contract in whole or in part for convenience as provided herein. The Owner may pursue any and all contractual, legal and equitable remedies for such breach or default. Absent an express written agreement to the contrary, a termination for the Owner's convenience shall not be deemed a waiver or release of any rights by the Owner nor shall the Owner be estopped from any legal or equitable remedies that may be appropriate.

5.4.3. Termination by Contractor after Suspension

If the Work has been wholly suspended pursuant to **5.3. Suspension Procedures** for more than ninety (90) days as measured from the date of the notice to suspend, then the Contractor may terminate this Contract by providing Owner with ten (10) days' Notice that the Contractor

shall deem the Contract to be terminated if the Owner does not provide Contractor with notice to resume Work within those ten (10) days. Such termination shall be treated as a termination for the Owner's convenience pursuant **to 5.4.2. Termination for Convenience**.

5.4.4. Contractor Obligations upon Termination

On receipt of notice of termination, the Contractor shall immediately discontinue the Work but shall do such Extra Work as may be ordered by the Owner's Representative or Owner to safeguard the Work then completed and the materials and Equipment then delivered to the Site of the Work and to leave the Work in a safe and useful condition. Payment for this Extra Work will be made in accordance with **9.2. PAYMENT FOR CHANGES**.

5.4.5. Ownership of Materials upon Termination

As of the termination date, whether effected by the Owner or Contractor as provided herein, all the Contractor's right, title, and interest in and to materials ordered by the Contractor prior to termination, whether or not they have been delivered to the Site of Work, shall be vested in the Owner, and the Contractor shall, upon demand of the Owner, execute and deliver to the Owner all requisite bills of sale, assignments, and other documents of transfer that may be necessary to give effect to the intention of the termination procedures set forth above.

5.4.6. Opportunity to Cure

If the Contractor has not already had an opportunity to cure the default or breach the Owner shall specify the default or breach and a reasonable period of time to allow the Contractor to cure the default or breach. The notice of termination will state the time period in which cure is permitted and other conditions as the Owner, in its sole judgment, shall deem appropriate. If Contractor fails to remedy the breach or default or any of the terms, covenants, or conditions of this Contract to the Owner's satisfaction within the time period specified or the Owner shall have the right to terminate the Contract without any further obligation to the Contractor. Any such termination for default shall not in any way operate to preclude the Owner from also pursuing all available remedies against Contractor and its sureties for said breach or default.

5.4.7 Waiver of Remedies for Any Breach

In the event that the Owner elects to waive its remedies for any breach by Contractor or any covenant, term or condition of this Contract, such waiver by the Owner shall not limit the Owner's remedies for any succeeding breach of that or of any other term covenant, or condition of this Contract.

5.5. POSSESSION AND USE OF COMPLETED PORTIONS OF THE WORK

The Owner shall have the right to take possession of and use completed or partially completed portions of the Work even though the time for completing the Work for such portions may not have expired. Operations and maintenance costs of use of such Work will be borne by the Owner. Such possession and use shall not be deemed as acceptance of the Work. If such prior possession or use increases the cost of the Work, the Contractor may be entitled to request extra compensation by giving Notice and following the procedures of **ARTICLE 10. NOTICE TO OWNER** and **ARTICLE 12. CONTRACT CLAIMS** within five (5) days of each occurrence. The Contractor shall not submit a Contract Claim for possession by the Owner of portions of the Work specifically required in the Contract Documents to be placed into use or operation before completion of the entirety of the Work.

5.6. POSSESSION OF INCOMPLETE PORTIONS OF THE PROJECT

Should the Contractor fail to meet any date specified for Substantial Completion of Work or any portion of work requiring early possession and use by the Owner, the Owner may, after a 10-day notice to the Contractor, take over such portion or any Work that is behind schedule. In such case, the Owner's Representative will prepare a list of incomplete Work taken over by the

Owner. The cost of Owner's work will be charged to and deducted from amounts due to the Contractor. The Substantial Completion date of the entire or a portion of the Project will be established as the date when the Owner actually begins using the Project or portion of the Project for its intended purpose. Division of responsibilities between Owner and Contractor, beginning of warranties, and any other issues relating to Substantial Completion shall be as specified in **5.7. SUBSTANTIAL COMPLETION**.

5.7. SUBSTANTIAL COMPLETION

When the Contractor considers the Work to be Substantially Complete and ready for its intended use, it shall give Notice to the Owner's Representative. The Notice shall include an itemized list of remaining incomplete Work. If the Owner's Representative determine the Work is not substantially complete, the Contractor will be notified in writing, identifying the reasons for such a determination. If the Owner's Representatives find the Work substantially complete, he or she will meet with the Contractor to (1) prepare a Punch List of incomplete items of Work; (2) define the division of responsibility between Owner and Contractor with respect to security, operation, maintenance, heat, utilities, insurance, and warranties; and (3) describe any other issues related to acceptance of the substantially completed Work.

If the Owner's Representative is not an employee of the Owner, the Owner's Representative will write to the Owner upon reaching agreement with the Contractor, certifying that the Work is substantially complete, listing the items of incomplete Work, stating the date for completion of incomplete Work, defining the division of responsibilities, and setting forth any other terms related to acceptance. In such event, the Owner will review the Owner's Representative's certification that the Work is substantially complete. If the Owner concurs, the Owner will notify the Contractor in writing that the Work is accepted as substantially complete. Except for any portion(s) of Work specified for early completion or required by the Owner for early possession, Substantial Completion will not occur for any Work until the entire Project is ready for possession and use. The acceptance notice will include a Punch List of incomplete Work items and corrective Work, set the date for their completion and repair, describe the division of responsibility between the Owner and Contractor, and describe any other terms of acceptance. The Contractor will acknowledge receipt of the acceptance notice in writing, indicating acceptance of all of its terms and provisions.

Subsequent to the Substantial Completion date, the Owner may exclude the Contractor from the Work during such periods when construction activities might interfere with the intended operation of the Project. The Owner, however, shall allow the Contractor reasonable access for completion or correction of incomplete Punch List items.

5.8. ACCEPTANCE OF WORK

Upon completion of the Project, including, but not limited to, record drawings, as-builts, required reports and operations and maintenance manuals, the Contractor shall so notify the Owner's Representative in writing. Upon receipt of the notification, the Owner's Representative will promptly, by personal inspection, determine the actual status of the Work in accordance with the terms of the Contract. If the Owner's Representative finds materials, Equipment, or workmanship that do not meet the terms of the Contract, he or she will prepare a Punch List of such items and submit it to the Contractor. Following completion of the corrective Work by the Contractor, the Owner's Representative will notify the Owner that the Work has been completed in accordance with the Contract. The Owner shall make the final determination of acceptability and completion. For portions of the Project not previously accepted as substantially complete, the conditions of guarantee shall commence on the date that the Owner determines the Project is complete.

6. CHANGES

6.1 OWNER'S RIGHT TO DIRECT CHANGES TO THE WORK

The Owner reserves the right to change the Work at any time. Such changes shall not invalidate the Contract nor release the surety, and the Contractor agrees to perform the Work as changed. Among others, these changes and alterations may include:

1. Deleting or omit any part of the Work, Equipment or material to be provided under this Contract, and
2. Increasing or decreasing quantities,
3. Altering Specifications, designs, or both,
4. Altering the way the Work is to be done,
5. Adding new Work or Extra Work,
6. Altering facilities, Equipment, materials, services, or sites, provided by the Owner, and
7. Ordering the Contractor to accelerate or Delay Work.

If the Contractor and Owner do not agree upon scope of Work changed or adjustment to the Contract Sum and Contract Time, the Owner may, at its sole option, unilaterally direct the Contractor to implement any change by notice. The Owner shall not pay or be responsible or liable for any change implemented by the Contractor without explicit notice from the Owner to proceed.

6.2 EXTRA WORK

At its sole option, the Owner may (1) perform Extra Work itself, (2) employ others to do it, (3) direct the Contractor to perform the Extra Work at existing unit bid price, (4) direct the Contractor to perform the Extra Work at a mutually agreed upon price, or (5) direct the Contractor to perform the Extra Work on a Force Account basis.

6.3 CHANGE ORDERS

Changes to the Work may result in an increase or decrease in Contract Sum, as provided in **9.2. PAYMENT FOR CHANGES**. Requests for an increase in Contract Time must be made as provided in **5.2.2.2 Extensions of Contract Time**, as applicable. Substantial changes in Contract Time, Contract Sum or Work will often be negotiated and agreed between the Contractor and Owner before the Owner directs the Contractor to proceed with the change.

If the Contractor and Owner agree on the scope of Work and any changes to Contract Sum and Contract Time, the Contractor and Owner shall execute an agreed Change Order. However, if the Contractor and Owner do not agree, the Owner may, in its sole discretion, issue a unilateral Change Order changing the scope of Work and making any adjustments to the Contract Sum pursuant to **9.2. PAYMENT FOR CHANGES** and Contract Time in such amount and for such time as the Owner thinks appropriate. Contractor agrees to use the agreed and unilateral Change Order forms included in the Contract Documents or otherwise provided by Owner. The Contractor accepts all requirements, terms and conditions of a Change Order by: signing it; writing a separate acceptance; or by failing to notify the Owner immediately in writing that Contractor disagrees with the Change Order and does not intend to be bound by its terms.

The Contractor waives all Contract Claims with respect to (and is estopped from denying its agreement with) any unilateral Change Order for which the Contractor does not immediately give Notice to the Owner as provided in **ARTICLE 10. NOTICE TO OWNER** and submit a Contract Claim as provided in **ARTICLE 12. CONTRACT CLAIMS**. A unilateral Change Order that is not timely protested as provided in this section shall be full payment and final settlement

of all asserted and unasserted Contract Claims for Contract Time and all costs of any kind, including costs of Delays, inefficiencies and impacts, related to, arising out of, or resulting from, any Work described in the Change Order.

The Contractor shall obtain written consent of the surety or sureties if the Owner's Representative requests such consent.

6.4 VALUE ENGINEERING AND COST SHARING

The Contractor may submit proposals for changing the Drawings, Specifications, or other requirements of the Contract Documents and the Owner, in its sole discretion, may accept or reject such proposals. If accepted by the Owner and if the proposal decreases the direct, actual costs of constructing the Work, the Contract Sum shall be reduced by fifty percent (50%) of the direct, actual construction cost saved. Because the Owner has the sole discretion whether to consider, accept or reject the Contractor's proposal and the Contractor has no right to require the Owner to consider or accept such proposals, the Owner's decision is not reviewable by any court. This subsection applies only to change proposals initiated solely by the Contractor (or its Subcontractors and Suppliers) and does not apply to change proposals requested or initiated by the Owner or the Owner's Representative. The Owner is not obligated or required to consider any Contractor initiated change proposals and may, in its sole discretion, refuse to do so. Under no circumstances shall the Contractor be entitled to additional compensation arising out of, or related to, the Owner's refusal to consider or approve a Contractor initiated change proposal. The Contractor shall not do any of the following without the express written agreement of the Owner: fail to perform any Work; commence performance of any proposed change; reduce its resources assigned to performance of the Work in order to prepare a change proposal or in anticipation of approval of a change proposal; adjust or change the project schedule or take any action or fail to do any action that would affect the Completion Date of the Work; take any action or fail to take any action arising out of the Contractor's change proposal that would result in the Contractor seeking an adjustment upward of the Contract Sum.

7. LABOR STANDARDS

7.1. WAGES OF EMPLOYEES

7.1.1. General

Pursuant to the requirements of Chapter 39.12 RCW, the Contractor and each Subcontractor or other person doing the whole or any part of Work to be performed under this Contract in the State of Washington shall pay each employee working in the State of Washington an amount not less than the general prevailing rate of wage, as specified by the Industrial Statistician of the Department of Labor and Industries of Washington State, paid in the vicinity of the Work to be performed under this Contract for the particular grade or occupation of each employee

Any employee whose type of work is not covered by any of the classified wage rates specified by the Industrial Statistician shall be paid not less than the rate of wage listed for the classification that most nearly corresponds to the type of work performed.

In case any Dispute arises as to what are the prevailing rates of wages for work of a similar nature that cannot be adjusted by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries of the State of Washington, and his or her decision therein shall be final and conclusive and binding on all parties involved in the Dispute. The schedule of prevailing wage rates as determined by the Industrial Statistician for the locality or localities where this Contract will be performed are by this reference made a part of this Contract as though fully set forth herein. The Contractor shall be held responsible for notifying its Subcontractors of these wage requirements. Failure by either the Contractor or any Subcontractors to comply with

requirements of Chapter 39.12 RCW will result in delay of payment to the Contractor and/or imposition of other sanctions as may be available under the law and this Contract.

7.1.2. Contractor's Responsibility

The Contractor will be held responsible for paying not less than the prevailing wages, including increases in such wages, over the term of this Contract. It is, therefore, imperative that the Contractor and its Subcontractors familiarize themselves with the wage rates before submitting bids based upon these Specifications.

7.1.3. Federal Labor Requirements

Contractor shall comply with applicable federal laws and regulations relating to workers, safety and labor.

7.2. PAYMENT CERTIFICATES

A. The Contractor and each Subcontractor on or before the date of commencement of the Work shall file a statement of "Intent to Pay" prevailing wages under oath with the Owner and with the Washington State Department of Labor and Industries certifying the rate of hourly wage including the usual benefits paid and to be paid each classification of laborers, workmen, or mechanics employed upon the Work by the Contractor or its Subcontractor that shall not be less than the prevailing rate of wage. No payment will be made to the Contractor prior to the submission of such statements and the issuance by the Industrial Statistician of said Department of an acknowledgment of approval. Such statement and any supplemental statements that may be necessary shall be filed in accordance with the practices and procedures required by the Department of Labor and Industries. Upon the completion of the Work, the Contractor and all of its Subcontractors shall submit affidavits of wages paid to the Department of Labor and Industries in such form as may be required by said Department. Payment of the retained percentage will not be made until certification is received from the Department of Labor and Industries that the prevailing wage requirements of state law have been satisfied.

B. Any fees charged by the Department of Labor and Industries for filing such statements or submitting such affidavits shall be the responsibility of the Contractor, and each Subcontractor; if, for any reason, the Owner pays such fees, then the Contractor shall be charged the amounts thereof.

C. Unless otherwise determined by Owner, the Owner will require payroll reports for the Contractor and every Subcontractor be submitted weekly to the Construction Division, Public Works Annex, 3101 Cedar Street, Everett, Washington 98201. The payroll reports shall contain the following information:

1. Name and residence address of each worker.
2. Social Security number of each worker.
3. Classification of work performed by each worker. The classification shall be specific and match the classification categories listed in the Contract Documents.
4. Total number of hours employed each day.
5. Total number of hours employed during the payroll period.
6. Straight time and overtime hourly rate of wages paid to each worker.
7. Total or gross amount earned by each worker.
8. Deductions for Medical Aid, FICA, Federal withholding tax, and any other deductions taken.
9. Net amount paid each worker.

10. Contractor's, or Subcontractor's, name and address.
11. Days and dates worked.
12. Date of final day of pay period.
13. Whether fringe benefits were paid to each worker as part of the hourly wage rate or whether fringe benefits were paid into an approved plan, fund, or program.

Payrolls may be submitted on Federal payroll form WH-347, or equivalent. The reverse side of the form contains an affidavit that shall be filled out and signed. If the Contractor's payroll reports are computerized, the computerized reports may be submitted along with a Statement of Compliance affidavit photo copied from the back of form WH-347, or equivalent.

The first payroll submitted for the Work for both the Contractor and each Subcontractor shall be labeled "Initial." The last payroll submitted for the Work for both the Contractor and each Subcontractor shall be labeled "Final." Payrolls shall be sequentially numbered for all periods in which Work has been done. A certificate of completion for the Work, signed by the City, will constitute acceptance of the Work. The issuance of this certificate of completion will not constitute acceptance of unauthorized or defective Work or material is performed.

7.3. HOURS OF LABOR

Contractor shall comply with all applicable laws and regulations regarding hours of work, including, but not limited to, RCW Chap. 49.28.

7.4. CONTRACT WORK HOURS

The Contractor shall comply with Section 103 of the Contract Work Hours and Safety Standards Act (40 U.S.C. section 327-330) as supplemented by Department of Labor Regulations (29 CFR, Part 5). Under this section the Contractor shall compute the wages of every mechanic and laborer on the basis of a standard work week of forty (40) hours. Work in excess of the standard work week is permissible, provided the worker is compensated as required by law.

7.5. OVERTIME WORK

Overtime and shift work may be established as a regular procedure by the Contractor with reasonable Notice to and written permission of the Owner’s Representative. Permission may be denied for such reasons as noise, traffic, or other interference with the neighborhood in which the Project is located, or the lack of availability of inspectors during overtime or shift work.

7.6 LABOR RELATIONS

The Contractor shall take all reasonable steps to prevent any labor Disputes involving the Contractor and any of its Subcontractors or Suppliers of any products or services from disrupting the Work under this Contract or interfering with access to the Owner's property by the Owner, including its agents, representatives, employees and officials, any other contractors engaged in construction activities, or members of the public. In the event any picketing or other concerted activity by employees involved in a labor Dispute with the Contractor or its Subcontractors or Suppliers interferes in any way with access to the Owner's property by any persons, the Contractor shall promptly and expeditiously take all reasonable actions to eliminate or minimize such interference, including but not limited to: (1) utilizing all reasonable means of restricting any picketing to a single entrance to the Owner's property; (2) posting notices or signs which advise interested persons and labor organizations that a particular entrance to the Owner's property is for the employees of "primary" or, as the case may be, "neutral" employers; (3) policing entrances to ensure that only authorized personnel may use those entrances; (4) notifying all interested labor organizations of the "primary" or "neutral" status of particular entrances; and (5) in the event any such picketing or concerted activity is unlawful or has a secondary impact upon the employees of neutral employers, promptly and expeditiously taking

appropriate action to seek recourse through the appropriate governmental agency or state or federal courts to limit the location of such picketing so as to reduce the impact thereof upon neutral employers.

The Owner will cooperate with the Contractor to accomplish the foregoing actions and will render assistance as may be in the best interests of the Owner. However, the Owner shall have the right to direct the Contractor to modify any of the foregoing actions the Contractor has taken or plans to take or to overrule such actions, to designate the entrances to be used as "primary" or "neutral" entrances, and to take appropriate legal action in order to protect the Owner's property and interests. In any event, the Contractor shall be liable for all Delays and costs, including costs to the Owner, and actual damages resulting from the relocation, rerouting, Delays or actions required to maintain the uninterrupted progress of the Work. Failure by the Contractor to take the actions described above or to comply with the directives of the Owner shall be considered a breach of this Contract and the Owner may terminate the Contract or suspend the Contractor as provided in this Contract.

8. MATERIAL, EQUIPMENT, WORKMANSHIP AND CONSTRUCTION UTILITIES

8.1. GENERAL

Unless otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for materials, labor, tools, Equipment, water, light, power, transportation, supervision, and temporary construction of any nature, and other services and facilities of any nature, whatsoever necessary, to execute, complete and deliver the Work within the specified time. Contractor shall be liable for all power and water costs until Substantial Completion, whether such power or water is provided by temporary or permanent facilities. Owner shall not be liable for any costs or Delays arising out of or caused by the availability or lack of availability of permanent power or utilities. Material and Equipment shall be new and of the specified quality. Equipment offered shall be new or current specified models. This requirement does not apply to minor details, or to thoroughly demonstrated improvements in design or in materials of construction. Construction Work shall be executed in conformity with the standard practice of the trade.

8.2. PRODUCT DATA

When specified, the Contractor shall provide data required for inspecting, testing, operating, or maintaining parts of the Work. Unless otherwise specified, such data shall be provided at the time the referenced material or Equipment is delivered to the job Site. The data shall be as specified and shall include, unless otherwise specified, such items as shop drawings, erection drawings, reinforcing steel schedules, testing and adjusting instructions, operations manuals, maintenance procedures, parts lists, and record drawings. Such data shall be provided as part of the Work under this Contract and its acceptability determined by the Owner in its sole discretion.

8.3. QUALITY

Where detailed Specifications of materials, Equipment, or construction Work are not set forth, the Contractor shall perform the Work using materials and Equipment of a quality comparable to the materials and workmanship specified for the other parts of the Work, from firms of established good reputations, and shall follow standard practices to perform construction Work of good quality in a workmanlike way. Work performed shall be in conformity and harmony with the intent to secure the standard of construction and Equipment of Work as a whole and in part. All Work must comply and conform to applicable building codes in effect when the Work is performed.

8.4. MATERIAL AND EQUIPMENT SPECIFIED BY NAME

When material or Equipment is specified by reference to patents, brand names, or catalog numbers, the Owner will not usually consider or approve a substitution. However, the Contractor may offer substitutions of products it considers to be equal to that specified, but the Owner is not obliged or required to consider or accept such offered substitution.

8.5. REQUESTS FOR SUBSTITUTION

The Contractor may offer material or Equipment of equal or better quality and performance in substitution for those specified. Only the Contractor may request substitutions. The Contractor's offers of substitution shall be made in writing to the Owner's Representative and shall include sufficient data to enable the Owner's Representative to assess the acceptability of the material or Equipment for the particular application and requirements. The Owner and Owner's Representative are not required or obligated to consider or review a request for substitution and may, in their sole discretion and option, consider or review such requests.

If the offered substitution requires changes to or coordination with other portions of the work, the Contractor shall include with its substitution request any such drawings and details showing such changes. The Contractor agrees to perform these changes as part of the substitution of material or Equipment at no additional cost to the Owner. Approval of a substitution request shall not relieve the Contractor from responsibility for the efficiency, quality, and performance of the substitute material or Equipment, in the same manner and degree as the material and Equipment originally specified. Any cost differential associated with a substitution shall be reflected in the offer. If the Owner approves the substitution, the Contract Documents shall be modified by a Change Order modifying the Contract Sum in the amount of the cost differential.

8.6. DEMONSTRATION OF COMPLIANCE WITH CONTRACT REQUIREMENTS

8.6.1. Inspection

The burden of proving the constructed Work complies with the Contract Documents shall be on the Contractor at all times. To demonstrate its compliance with the Contract requirements, the Contractor shall assist the Owner's Representative in his or her inspection and observation of the Work. The Contractor shall grant the Owner's Representative access to the Work and Work Site, and to places where Work is being prepared, or where materials, Equipment, or machinery are being obtained for Work. The Contractor shall provide information requested by the Owner's Representative in connection with inspection work.

If the Contract Documents, laws, ordinances, or any public regulatory authority requires parts of the Work to be specially inspected, tested, or approved, the Contractor shall give the Owner's Representative adequate prior written Notice of the availability of the subject Work for examination, which Notice shall be not less than two (2) working days.

Inspection and quality control tests performed on Work by the Contractor by the Owner's Representative shall not relieve the Contractor of its responsibility for errors or lack of quality therein and shall not be regarded as an assumption of risks or liability by the Owner's Representative for the Contractor's compliance with these Contract Documents. Contractor remains responsible and liable for all errors, defects or a lack of quality not discovered by inspection or observation.

If parts of the Work are covered prior to inspection or observation, the cost of exposing the Work for inspection and closing and re-covering shall be borne by the Contractor regardless of whether the Work is found to be in compliance with the Contract.

8.6.2. Samples of Materials

The Contractor shall provide Samples or specimens of materials to be incorporated in the Work that require laboratory examination or special testing, as requested by the Owner's

Representative. Such Samples or specimens shall be provided in ample time to permit making proper test analysis and examinations before the Contractor plans to incorporate the material into the Work. An independent testing laboratory will conduct tests of material in accordance with the Specifications. In the absence of a specific test requirement, the Owner's Representative will determine the appropriate standard test to be used.

8.6.3. Certification

In cases where compliance of materials or Equipment to Contract requirements is not readily determinable through inspection and tests, the Contractor shall provide properly authenticated documents, certificates, or other proof satisfactory to the Owner's Representative that the materials and Equipment comply with the Contract requirements. These documents, certifications, and proofs shall include performance characteristics, construction materials, and physical or chemical characteristics of materials. The Contractor shall pay all associated costs of such certification.

8.6.4. Inspection at Point of Manufacturing

The Contractor shall be responsible and reimburse the Owner for the costs of inspections occurring outside of Whatcom, Skagit, Island, Snohomish, King, Pierce and Thurston counties if (a) inspection and testing of materials or Equipment in the vicinity of the Work by the Owner is not practicable, (b) the Contractor requests the Owner to inspect and test material or Equipment at the point of manufacture, or (c) the Specifications require that inspection, testing or witnessing of tests take place at the point of manufacture. Costs to be paid or reimbursed by the Contractor include, but are not limited to, travel, subsistence, labor and lodging expenses of the Owner's inspector.

8.6.5. Testing and Commissioning of Completed Work

Testing and commissioning of all mechanical, electrical, and instrumentation systems and completed portions of the Work, functioning as a completed system and the complete Project, functioning as a completed facility, shall be done in accordance with the Specifications.

8.6.6. Storage of Materials and Equipment

Contractor shall store materials and Equipment so as to insure the preservation of their quality and fitness for the Work. Stored Equipment and materials shall be located so as to facilitate inspection. The Contractor shall be responsible for damages, loss or casualty occurring to materials and Equipment until Final Acceptance.

8.6.7. Manufacturer's Directions

Manufactured articles, material and Equipment shall be transported, stored, applied, installed, connected, erected, adjusted, tested, operated and maintained as recommended by the manufacturer, unless otherwise specified herein. Manufacturer's installation instructions and procedures shall be provided to the Owner prior to installation of the manufactured articles, material and Equipment.

8.7. DEFECTIVE WORK

8.7.1. Correction of Defective Work

When, and as often as the Owner's Representative determines through his or her inspection procedures, material, Equipment or workmanship incorporated in the Project do not meet the requirements of the Contract, the Owner's Representative will give written notice of the noncompliance to the Contractor. Within fourteen (14) days from the receipt of such notice, the Contractor shall undertake the Work necessary to correct the deficiencies, and to comply with the Contract. If the Contractor disagrees with the Owner's Representative's determination and believes that the corrective Work should be covered by a Change Order, he or she shall

immediately notify the Owner, in writing, setting forth its position. Within five (5) days after receipt of the Contractor's notification, the Owner will review the matter and notify the Contractor, in writing, of his or her determination.

If the Owner determines that the corrective Work is required to comply with the Contract, the Contractor shall proceed with such Work. As a condition precedent to the Contractor's request for adjustment of Contract Sum, Contract Time, or both, resulting from the performance of such corrective Work, the Contractor shall, within fifteen (15) days after receipt of the Owner's determination, provide the Owner with Notice of a Contract Claim for an adjustment of Contract Sum, Contract Time, or both. Contract Claims not timely and completely submitted are deemed waived. The Contractor shall document the cost information associated with the corrective work with daily records in accordance with Force Account procedures and shall provide such information to the Owner's Representative daily. Receipt of the cost data by the Owner's Representative will not be construed to be an acceptance of the corrective Work, or an authorization for a Change Order to cover the corrective Work. Contractor waives any such Contract Claim by failing to maintain accurate and complete Force Account records.

8.7.2. Retention of Defective Work

In its sole discretion, the Owner may retain Work that is not in compliance with the Contract. The Owner will determine the just and reasonable value for such defective and/or noncompliant Work and deductions will be made in the payments due or to become due to the Contractor. Final Acceptance will not act as a waiver of the Owner's right to recover from the Contractor an amount representing the deduction for retention of defective and/or noncompliant Work.

8.8. MATERIALS AND EQUIPMENT FURNISHED BY OWNER

Contractor shall install materials and Equipment furnished by the Owner as provided in the technical sections of the Specifications. Furnishing of material and Equipment by the Owner will be considered conclusive evidence of their acceptability for the purpose intended. If the Contractor discovers defects in material or Equipment furnished by the Owner, he or she shall immediately notify the Owner. After such discovery, the Contractor shall not proceed with Work involving Owner-furnished materials and Equipment unless authorized by the Owner. Unless otherwise noted or specifically stated, materials and Equipment furnished by the Owner, which are not of local occurrence or manufacture, are considered to be "FOB" railroad station or truck terminal nearest to the Site of the Work. At no cost to the Owner, the Contractor shall unload, transport, store, and protect such material and Equipment from damage. The Contractor shall inspect such Owner-furnished material and Equipment on receipt and provide the Owner with written acceptance for the incorporation of said material and Equipment into the Work. After receipt by the Contractor, the Contractor bears all risk of loss and casualty to Owner furnished materials and Equipment.

8.9. GUARANTEE

The Contractor warrants to the Owner that all materials and Equipment furnished under this Contract will be of highest quality and new unless otherwise specified by the Owner, free from faults and defects and in conformance with the Contract Documents. All Work not so conforming to these standards shall be considered defective. If required by the Owner's Representative, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and Equipment.

The Work furnished must be of first quality and the workmanship must be the best obtainable in the various trades. The Work must be of safe, substantial and durable construction in all respects.

"Acceptance of the Work" shall not extinguish any covenant or agreement on the part of the Contractor to be performed or fulfilled under this Contract that has not, in fact, been performed

or fulfilled at the time of such acceptance. All covenants and agreements shall continue to be binding on the Contractor until they have been fulfilled.

The Owner and the Contractor agree that the guarantee on the completed portions of the Work possessed and used by the Owner shall commence as to those portions on the date that the Owner takes possession of those portions and so notifies the Contractor in writing. Owner and Contractor further agree that such taking possession and use shall not be deemed as acceptance of the Work. Takeover of completed portions of the Work shall be at the Owner's option and will not be made until the Work can be put into routine service on a permanent basis.

The guarantee provided in this section 8.9 shall be in addition to those specific guarantee or warranty requirements for particular Equipment and Work items as indicated in the Specifications.

8.10. CORRECTION PERIOD

If within one year after the date of Substantial Completion, or such longer period of time as may be prescribed by the terms of any applicable special guarantee or warranty required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damage to the land or areas made available for Contractor’s use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 8.6.6. is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner’s written instructions:

1. repair such damaged land or areas; or
2. correct such defective Work; or
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting there from.

If Contractor does not promptly comply with the terms of Owner’s written instructions, or in an emergency where Delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of Work of others) will be paid by Contractor.

The Owner is hereby authorized to make such repairs if, ten (10) days after giving of such notice to the Contractor, the Contractor has failed to make or undertake the repairs with due diligence. In case of an emergency where, in the opinion of the Owner, Delay could cause serious loss or damage, repairs may be made prior to or concurrent with notice being sent to the Contractor. All expenses in connection with such repairs will be charged to the Contractor.

In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

Where defective Work (and damage to other Work resulting there from) has been corrected or removed and replaced under this Paragraph 8.10, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

Contractor's obligations under this Paragraph 8.10 are in addition to any other obligation, guarantee or warranty. The provisions of this Paragraph 8.10 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

9. MEASUREMENT AND PAYMENT

9.1. PAYMENTS TO CONTRACTOR

9.1.1. Schedule of Values

The Contractor shall submit a Schedule of Values at least fifteen (15) days prior to submitting its first Application for Payment. If the Project contains Unit Price Work, in whole or in part, then the Schedule of Values for that portion of the Work shall also be based on unit prices. If the Bid form calls for a lump sum price, in whole or in part, then the Schedule of Values shall: reasonably allocate the Contract Sum among the various portions of the Work; be complete; be organized to include detailed breakdown of each major unit of the Work; be organized to correspond to Contractor's schedule; break down the Contract Sum showing the value assigned to each part of the Work; include an allowance for profit and Overhead; include Unit Price Work, if and to the extent indicated on the Bid form; be so organized as to facilitate assessment of work and payment of Subcontractors; and be balanced. To the greatest extent possible, the breakdown shall use the same tasks or units as the Contractor's schedule. Contractor shall provide documentation substantiating the cost allocation if asked by the Owner's Representative. Upon acceptance of the Schedule of Values by the Owner's Representative, it shall be used as a basis for all requests for payment.

9.1.2. Progress Payments

9.1.2.1 Payment Request Procedures

By the tenth day of each month, or by schedule mutually agreed upon in writing by the Contractor and Owner's Representative, the Contractor shall submit to the Owner's Representative a partial payment estimate filled out and signed by the Contractor covering acceptable Work performed during the previous month, or since the last partial payment estimate was submitted. Contractor's submission of a progress pay estimate constitutes a material representation by the Contractor that it performed all of the Work described in the progress pay estimate during the relevant time period in a workmanlike manner and that the materials for which payment is requested reasonably conform to the Specifications and are either on the job Site or have been installed. If requested by the Owner's Representative, the Contractor shall provide such additional data as may be reasonably required to support the payment estimate. Such data may include satisfactory evidence of payment for Equipment, materials and labor including payments to Subcontractors and Suppliers. Certified invoices by the Suppliers shall accompany a request for payment for delivered Equipment and material. Such Equipment and material shall be suitably and safely stored at the Site of the Work. Payment requests shall summarize accepted operating and maintenance material with request for Equipment payment. A progress payment is preliminary only. By making a progress payment, the Owner does not waive or release its right, nor is it estopped from asserting, that previous progress payments were not earned or were in error, whether in whole or in part.

9.1.2.2 Review Procedures

The Owner's Representative will review the estimate and either indicate in writing to the Owner his or her concurrence with the estimate and his or her recommendation that payment be made, or indicate in writing to the Contractor his or her reasons for not concurring with the estimate. If the Owner's Representative recommends payment and the Owner concurs, the Owner will pay the Contractor a progress payment on the basis of the approved partial payment estimate, less retainage and any amounts the Owner may withhold pursuant to Contract or law. The

recommendation of the Owner's Representative is not conclusive, final or binding upon the Owner.

In the event the Owner's Representative does not concur with the estimate, the Contractor may make the changes necessary to obtain the Owner's Representative's concurrence and resubmit the partial payment estimate, or submit the original progress payment estimate directly to the Owner, indicating in writing its reasons for refusing to make the changes necessary to obtain concurrence.

9.1.2.3 Retained Percentage

As provided in **9.7. RETAINAGE**, the Owner will retain five percent (5%) of all progress payments.

9.1.2.4 Withholding

The Owner's Representative may refuse to recommend the whole or any part of any payment if in the Owner's Representative's opinion it would be incorrect to make such recommendation to the Owner. The Owner's Representative may also refuse to recommend any such payment, or because of subsequently discovered evidence or the result of tests, may nullify any such payment previously recommended to such extent as may be necessary in the Owner's Representative's opinion to protect the Owner from loss as a result of:

1. Defective or damaged Work.
2. A deductive Change Order.
3. Persistent failure of the Contractor to perform the Work in accordance with the Contract Documents, including failure to maintain the progress of the Work in accordance with the construction schedule. Persistent failure to maintain the progress of the Work shall mean that for a period of two consecutive months following a written notice from the Owner's Representative or Owner, the Contractor fails to correct a behind-schedule condition at a rate that would reasonably indicate that he or she will finish the Project on schedule.
4. Disregard of authority of the Owner or Owner's Representative or the laws of any public body having jurisdiction.
5. Liquidated damages.
6. Misrepresentation of the quality of materials installed or amount of Work performed.
7. Discovery that a previous pay estimate erred with respect to the amount of Work performed or materials installed, irrespective of the Owner's Representative's recommendation at the time of the progress pay estimate.
8. Any other event that consists of a default under Section 5.4.1 of these General Conditions.

The Owner may refuse to make payment of the full amount recommended by the Owner's Representative because of Contract Claims made against the Owner on account of Contractor's performance or furnishing the Work or because of liens filed in connection with the Work or other set offs entitling Owner to reduce the amount recommended. In such case, the Owner shall give Contractor prompt written notice with copy to the Owner's Representative stating the reasons for each action.

9.1.3. Final Payment

Upon receipt of Contractor's written Notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Owner's Representative will inspect the Work. If the Owner's Representative finds the Work acceptable under the Contract Documents and the Contract fully performed and if the Contractor has signed a final contract voucher in the form provided by the City, the Owner's Representative will issue a final certificate

for payment. The certificate for payment (or certificate of completion) will state that to the best of the Owner's Representative's knowledge, the Work appears to have been completed in accordance with terms and conditions of the Contract Documents.

Final payment shall not become due until the Contractor, unless otherwise determined by the City, submits to the Owner's Representative; (1) an affidavit that payrolls, bills for materials and Equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered, less amounts withheld by Owner, have been paid or otherwise satisfied; (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) days' prior written Notice has been given to the Owner; (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents; (4) consent of surety, if any, to final payment; and (5) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

Prior estimates and payments, including those relating to Extra Work or Work omitted, shall be subject to correction by the final payment.

If, after Substantial Completion of the Work, Final Acceptance thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting Final Acceptance, and the Owner's Representative so confirms, the Owner may, upon application by the Contractor and certification by the Owner's Representative, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Owner's Representative prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Acceptance of final payment by the Contractor, a Subcontractor or material Supplier shall constitute a waiver of Contract Claims by that payee, except those Contract Claims previously timely and completely submitted that remain pending at the time of final payment, provided that Contractor specifically so notifies the Owner in writing prior to the Owner making such final payment. Payment by the Owner shall not release the Contractor or its surety from any obligation under the Contract or under the payment and performance bond.

9.2. PAYMENT FOR CHANGES

9.2.1. Changes in Estimated Quantities of Unit Price Work

Contractor will be paid only for the actual quantities of Work performed and accepted in conformance with the Contract. When the accepted quantities of an item of Unit Price Work vary from the quantities originally estimated in the Contract Documents, payment will be at the Contract unit prices for accepted Work. If the total quantity of a Unit Price Work item varies by more than twenty-five percent (25%) from the quantity originally estimated in the Contract Documents, that part of the variance exceeding twenty-five percent (25%) may be adjusted as follows:

9.2.1.1. Increased Quantities

Either party to the Contract will be entitled to renegotiate the price for that portion of the actual quantity in excess of one hundred twenty-five percent (125%) of the original Bid quantity. The price for increased quantities will be determined by agreement of the parties, or, where the parties cannot agree, the price will be determined by the Owner's Representative based upon the actual costs to perform the Work, including reasonable markup for Overhead and profit.

9.2.1.2. Decreased Quantities

Either party to the Contract will be entitled to an adjustment of Contract Sum if the actual quantity of Work performed is less than seventy-five percent (75%) of the original Bid quantity. The adjustment of Contract Sum in the case of decreased quantities shall be based upon any increase or decrease in costs due solely to the variation of the estimated quantity. The total payment for any item will be limited to no more than seventy-five percent (75%) of the amount originally Bid for the item.

9.2.1.3. Limitations

The following limitations shall apply to the adjustment:

1. The equipment rates shall be actual cost but shall not exceed the rates set forth in the AGC/WSDOT Equipment Rental Agreement in effect at the time the Work is performed.
2. No payment will be made for extended or unabsorbed home office Overhead and field Overhead expenses to the extent that there is an unbalanced allocation of such expenses among the Contract bid items.
3. No payment for consequential damages or loss of anticipated profits will be allowed because of variance in quantities from those originally shown in the bid form, Contract provision, and Drawings.

When ordered by the Owner's Representative, the Contractor shall proceed with the Work pending determination of the adjustment of Contract Sum or Contract Time for the variation in quantities.

The Owner will not adjust for increases or decreases if the Owner has entered the amount for the item in the bid form only to provide a common Bid for Bidders.

9.2.2. Changes in Work Not Covered By Unit Prices

Contractor shall be paid for changes in Work not covered by unit prices as provided in **9.5. ADJUSTMENT OF CONTRACT SUM**.

9.2.3. Deleted Work

The Owner's Representative may delete Work as provided in **ARTICLE 6. CHANGES** or may terminate the Contract in whole or part as provided in **5.4.2. Termination for Convenience**. When the Contract is partially terminated for the Owner's convenience, the partial termination shall be treated as a deductive Change Order for payment purposes under this section.

Payment for completed items will be at Contract unit prices or pursuant to the Schedule of Values.

When a Change Order deletes an item in whole or in part, or when the Contract is terminated for convenience in whole or in part, payment for deleted or terminated Work will be made as follows:

1. Payment will be made for the actual number of units of Work completed at the unit contract prices unless the Owner's Representative determines the unit prices are inappropriate for the Work actually performed. When the Owner's Representative determines the unit prices are inappropriate for the Work actually performed, payment

for Work performed will be as mutually agreed. If the parties cannot agree, the Owner's Representative will determine the amount of the adjustment of Contract Sum in accordance with **9.5. ADJUSTMENT OF CONTRACT SUM**;

2. Payment for partially completed lump sum items will be as mutually agreed. If the parties cannot agree, the Owner's Representative will determine the amount of the adjustment of Contract Sum in accordance with **9.5. ADJUSTMENT OF CONTRACT SUM**;
3. To the extent not paid for by the Contract Sum for the completed units of Work, the Owner will pay as part of the adjustment of Contract Sum those direct costs necessarily and actually incurred by the Contractor in reasonable anticipation of performing the Work that has been deleted or terminated;
4. The total payment for any one item in the case of a deletion or partial termination shall not exceed the Bid price as modified by approved Change Orders less the estimated cost, including Overhead and profit, to complete the Work and less any amount paid to the Contractor for the item;
5. If the entire remainder of the Contract is terminated, the total payment to the Contractor shall not exceed the total Contract Sum as modified by approved Change Orders less those amounts paid to the Contractor before the effective date of the termination; and
6. No claim for damages of any kind or for loss of anticipated profits or consequential damages on deleted or terminated Work will be allowed because of termination or Change Order. Contract Time shall be adjusted as the parties agree. If the parties cannot agree, the Owner's Representative will determine the adjustment of Contract Time.

Acceptable materials ordered by the Contractor prior to the date the Work was terminated or deleted will either be purchased from the Contractor by the Owner at the actual cost and shall become the property of the Owner, or the Owner will reimburse the Contractor for the actual costs of returning these materials to the Suppliers.

If Contractor disagrees with the adjustment of Contract Sum determined by the Owner's Representative, Contractor may submit a Contract Claim for the difference between the amount determined by the Owner's Representative and the amount sought by the Contractor.

Contractor shall not be entitled to anticipated profits on deleted, terminated, or uncompleted Work.

9.3. CHARGES TO CONTRACTOR

The Contractor shall pay the Owner on demand everything charged to it under the terms of this Contract. Such charges may be deducted by the Owner from money due or to become due to the Contractor under the Contract. The Owner may recover such charges from the Contractor or from its surety.

Contractor agrees to pay the costs of overtime or excessive inspection and observation costs incurred by the Owner. Overtime inspection shall include inspection required during Saturdays, Sundays, City holidays and weekdays, in excess of 40 hours per week or outside of normal working hours and inspections or observations that result in an inspector or observer working more than forty hours in a week. Costs of such overtime or excessive inspection or observation include architecture, engineering, construction management services, inspection, general supervision and Overhead expenses which are directly chargeable to the overtime or excessive work. Contractor agrees that Owner will deduct such charges from payments due the Contractor. In the event the Owner by Change Order requires the Contractor to work in excess of the established schedule of working hours, the Owner will not charge the Contractor for inspection costs associated therewith.

9.4. COMPENSATION TO OWNER FOR TIME EXTENSION

The Owner shall be compensated by the Contractor for the actual costs to the Owner of engineering, inspection, general supervision, right-of-way costs, permit fees, Overhead expenses, and any other ascertainable direct costs to the Owner that are directly chargeable to the Work and which accrue during the period of such extension. The actual costs do not include charges for final inspection and preparation of the final payment by the Owner.

9.5. ADJUSTMENT OF CONTRACT SUM

9.5.1 Calculation

Except as otherwise expressly provided in these General Conditions, any and all adjustments of Contract Sum shall be determined as follows:

1. If the parties are able to agree, the price will be determined by using:
    a. Unit prices, if the Work items are defined by unit prices; and
    b. Other prices agreed upon by the Contractor and Owner for Work not defined by unit prices.
2. If the parties cannot agree, the Owner's Representative will determine the price pursuant to the following order:
    a. Unit prices, if the Work items are defined by unit prices; and
    b. Other means to establish the reasonable cost of the Work if it is not defined by unit prices, including, but not limited to, Force Account as described in **9.6. FORCE ACCOUNT**, the Schedule of Values, or estimating manuals.

9.5.2 Limitations

The following limitations shall apply in determining the amount of an adjustment:

1. Except as otherwise expressly provided, Contractor will only be paid for costs it clearly and convincingly proves it actually and directly incurred, and shall not include consequential or indirect damages not otherwise expressly permitted by the Contract Documents. Costs and damages for which Owner shall not be liable under any circumstances include, but are not limited to: (a) borrowing or interest costs, charges, or expenses of Contractor; (b) alleged lost profit or Overhead on any other project; and (c) Contractor's failure or inability to obtain other work.
2. No Contract Claim for adjustment of Contract Sum or additional compensation for extra, affected, impacted or inefficient Work will be allowed where the Contractor does not keep and maintain contemporaneous, complete and accurate time records for labor and equipment and contemporaneous, complete and accurate records for materials and where such records do not contemporaneously segregate and allocate by time, location and work the time and costs for each item or element of such work. Contractor's failure to keep and maintain such records constitutes a waiver of any Contract Claim or request by the Contractor for adjustment of Contract Sum for such costs or event.
3. To the extent the Contractor is entitled to an adjustment of Contract Sum due to any Delay or extension of Contract Time, Contractor shall be compensated as provided in **12.4 REMEDIES**. Such compensation shall be full, adequate and complete compensation for all direct, indirect, cumulative, inefficiency, impact and ripple costs causing, arising out of, or relating to such delays or extension.
4. Contractor and Owner agree that compensation to the Contractor for a Contract Claim shall not exceed the Contractor's actual costs based upon Force Account as described in **9.6. FORCE ACCOUNT**. Contractor waives, releases, and agrees not to submit any

request for adjustment of Contract Sum or Contract Claim based upon a "total cost" or "modified total cost" calculation, in whole or in part, but instead agrees that any and all requests for compensation shall be based upon accurate, complete and contemporaneous cost records that segregate and allocate actual costs (a) between base Contract Work and the work for which additional compensation is sought and (b) between each item of work for which additional compensation is sought. Claims for inefficiency shall only be based on and calculated by a comparison of productivity of similar Work performed in an unaffected or least affected area of the Project.

5. No claim for consequential damages of any kind will be allowed.

9.5.3 Unabsorbed and Extended Overhead

Any Extended or Unabsorbed Overhead to which the Contractor may be entitled shall be calculated using the *Eichleay* formula by:

1. Determining the pro-rata amount of Overhead allocable to the subject project. This is accomplished by multiplying Overhead costs by the ratio of the subject project's billings to the Contractor's overall billings during the overall period of the subject Project's performance. The result is "Allocable Overhead."
    a. Any additional and unresolved direct cost claims presented by the Contractor concurrently with any request for Extended and/or Unabsorbed Overhead shall not be included in determining the ratio of the subject Project billings to overall Contractor billings for the period of project performance.
2. Determining the daily amount of Allocable Overhead for the subject Project. This is accomplished by dividing the Allocable Overhead for the subject Project by the number of days (as contractually defined) of Contract performance. The result is the Daily Rate of Allocable Overhead.
3. Determining the gross amount of potential additional compensation for Home Office Overhead due to the project extension. This is accomplished by multiplying the Daily Rate of Allocable Overhead by the number of days of project extension caused solely by the Owner. This results in the Gross Amount of Additional Home Office Overhead Compensation.
4. Adjusting the Gross Amount of Additional Home Office Overhead Compensation for any additional contribution for Overhead received by the Contractor on any Change Orders that are being presented and resolved concurrently with the subject calculation for Unabsorbed and/or Extended Home Office Overhead. The necessary adjustment would be to reduce the Gross Amount of Additional Home Office Overhead Compensation by any additional compensation for Overhead included in any direct cost claims being resolved concurrently with any claim for Extended and/or Unabsorbed Home Office Overhead.

Contractor shall not receive compensation for cost of use of equity capital.

9.6. FORCE ACCOUNT

If Work or materials are to be paid for by Force Account, payment amounts will be determined and Contractor shall contemporaneously prepare, keep and maintain records segregated and allocated by time, location and item of Work in compliance with this subsection. Such records must be contemporaneously countersigned by the Owner or the Owner's Representative (or its designee). Any records not countersigned by the Owner or Owner's Representative shall be excluded from the calculation of payment under this subsection.

The payments provided for herein shall be full payment for all Work done on a Force Account basis. The payment shall be deemed to cover all expenses of every nature, kind, and

description, including all Overhead expenses, profit, occupational tax and any other Federal or State revenue acts, premiums on public liability and property damage insurance policies, and for the use of small tools and equipment for which no rental is allowed.

No Contract Claim for Force Account shall be allowed except upon written order by the Owner's Representative for Extra Work prior to the performance of the Extra Work. No Extra Work shall be construed as Force Account Work that can be measured under the Specifications and paid for at the unit prices or lump sum named in the Contract.

The Owner's Representative shall compute the amount and costs of any Work to be paid by Force Account, and the amount certified by the Owner's Representative shall be final as provided in **3.2. OWNER'S REPRESENTATIVE**.

The Contractor's wage, payroll, and cost records pertaining to Work paid for on a Force Account basis shall be open to inspection or audit as provided in **ARTICLE 17. AUDITS**.

9.6.1 Labor

The Owner will reimburse the Contractor for labor and for supervision by foremen dedicated solely to the particular Force Account item of Work, but not for supervision by general superintendents or general foremen. The Owner's Representative will compute the labor payment on the basis of these four factors:

1. Weighted Wage Rate. The Weighted Wage Rate combines:
   a. the current basic wage and fringe benefits the Contractor is required and has agreed to pay,
   b. Federal Insurance Compensation (FICA),
   c. Federal Unemployment Tax Act (FUTA), and
   d. State Unemployment Tax Act (SUTA)

   A Weighted Wage Rate shall be computed for each classification of labor used. This rate shall reflect the Contractor's actual cost. It shall neither exceed what is normally paid to comparable labor nor fall below the minimum required by **7.1. WAGES OF EMPLOYEES**. If the Owner's Representative authorizes overtime, the Weighted Wage Rate shall be determined on the same basis.
2. Travel Allowance and Subsistence. This includes the actual costs of allowances for travel or subsistence paid to employees in the course of their work on the item. This reimbursement will be made only if such allowances are required by a regional labor agreement or are normally paid by the Contractor to comparable labor for performing other work.
3. Industrial Insurance and Medical Aid Premiums. The Owner will reimburse Contractor-paid premiums for Marine Industrial Insurance, for State of Washington Industrial Insurance, and Medical Aid Premiums that become an obligation of the Contractor and are chargeable to the Force Account Work. The Owner will not pay the Contractor for Medical Aid premiums that are paid by the employees.
4. Overhead and Profit. The Owner will pay the Contractor twenty-nine (29) percent of the sum of the costs listed in a, b, and c above to cover Project Overhead, general company Overhead, profit, and any other costs incurred.

9.6.2. Materials.

The Owner will reimburse actual invoice cost for Contractor-supplied materials. This cost includes actual freight and express charges and taxes, provided that these costs have not been paid in some other manner under the Contract. A deduction will be made for any offered or

available discounts or rebates if the Owner has provided the Contractor with the means to comply with the provisions allowing the discount. The Owner will then add twenty-one (21) percent of the balance to cover Project overhead, general company Overhead, profit, and any other cost of supplying materials.

To support charges for materials, the Contractor shall provide the Owner's Representative with authentic, complete and accurate copies of vendor invoices, including freight and express bills. If invoices are not available for materials from the Contractor stocks, the Contractor shall certify actual costs by affidavit.

If Contract Claims for materials costs are too high, inappropriate, or unsupported by satisfactory evidence, the Owner's Representative may determine the cost for all or part of the materials. When determined in this manner, the cost will be the lowest current wholesale price from a source that can supply the required quantity, including delivery costs.

The Owner reserves the right to provide materials. If so, the Contractor will receive no payment for any costs, Overhead, or profit on such materials.

9.6.3. Equipment

The equipment rates shall be actual cost but shall not exceed the rates set forth in the AGC/WSDOT Equipment Rental Agreement in effect at the time the Work is performed.

The approval of the Owner's Representative shall be required for the selection of machine-power tools or equipment prior to their use in Force Account situations.

The payment for any machine-power tools or equipment shall be made according to the current AGC/WSDOT Equipment Rental Agreement in effect at the time the Force Account is authorized. The rates as set forth in the Rental Rate Blue Book (as modified by the current AGC/WSDOT Equipment Rental Agreement) are the maximum rates allowable for equipment of modern design and in good working condition. These rates shall be full compensation for all fuel, oil, lubrication, repairs, maintenance, and all other costs incidental to furnishing and operating the equipment except labor for operation.

The Owner will add twenty-one (21) percent to equipment costs to cover Project Overhead, general company Overhead (excluding equipment Overhead included in the Rental Rate Blue Book), and profit.

Current copies of the Rental Rate Blue Book and the AGC/WSDOT Equipment Rental Agreement will be maintained at each region office of the Washington State Department of Transportation and at each of the offices of the Associated General Contractors of America, in Seattle, Spokane, Tacoma, Washington and Wilsonville, Oregon, where they are available for inspection.

9.6.4. For Services.

Compensation under Force Account for specialized services shall be made on the basis of an invoice from the providing entity. A "specialized service" shall be one that is typically billed through invoice in standard industry practice. Before Work is started, the Owner's Representative may require the Contractor to obtain multiple quotations for the service to be utilized and select the provider with prices and terms most advantageous to the Owner. In the event that prior quotations are not obtained and the service invoice is submitted by the Subcontractor, then after-the-fact quotations may be obtained by the Owner's Representative from the open market in the vicinity and the lowest such quotation may be used in place of the submitted invoice.

Except as noted below, the Owner will pay the Contractor an additional twenty-one (21) percent of the sum of the costs included on invoices for specialized services to cover project Overhead,

general company Overhead, profit, bonding, insurance, Business & Occupation tax, and other costs incurred.

When a Supplier of services is compensated through invoice, but acts in the manner of Subcontractor, as described in **9.6.6. For Contractor Markup of Subcontractors Work** of this provision, then markup for that invoice shall be according to **9.6.6. For Contractor Markup of Subcontractors Work**.

9.6.5. For Mobilization.

Force Account mobilization is defined as the preparatory work performed by the Contractor including procurement, loading and transportation of tools and equipment, and personal travel time, when such travel time is a contractual obligation of the Contractor or a customary payment for the Contractor to all employees. Mobilization also includes the costs incurred during demobilization applies to both Force Account and other Contract Work. Owner will pay for mobilization for off-site preparatory work for Force Account items provided that Notice has been provided sufficiently in advance to allow the Owner's Representative to witness the activity, if desired.

Any costs experienced during mobilization activities for labor, equipment, materials or services shall be listed in that section of the Force Account summary and paid accordingly.

9.6.6. For Contractor Markup on Subcontractor's Work

When Work is performed on a Force Account basis by one or more approved Subcontractors, by lower-tier Subcontractors or Suppliers, or through invoice by firm(s) acting in the manner of a Subcontractor, the Contractor will be allowed an additional markup, from the table below, applied to the costs computed for Work done by each Subcontractor through **9.6.1**, **9.6.2**, **9.6.3**, and **9.6.4**, to compensate for all administrative costs, including project Overhead, general company Overhead, profit, bonding, insurance, Business & Occupation tax, and any other costs incurred.

A firm may be considered to be acting as a Subcontractor when the Owner's Representative observes one or more of the following characteristics:

1. The person in charge of the firm's activities takes an active role in managing the overall project, including extensive coordination, interpretation of Drawings, interaction with the Owner or management of a complex and interrelated operation.
2. Rented equipment is provided fueled, operated and maintained by the firm. Operators of rented equipment are supervised directly by the firm's representative. There is a little interaction between the Contractor and the employees of the firm.
3. The firm appears to be holding the risk of performance and quality of the Work.
4. The firm appears to be responsible for liability arising from the Work.

Markups on Work Performed by Subcontractor(s):

On amounts paid for Work performed by each Subcontractor on each Force Account and calculated through 9.6.1-4	Up to $25,0000	12%
On amounts greater than	$25,000 up to $100,000	10%
On amounts greater than	$100,000	7%

The amounts and markup rates shall be calculated separately for each Subcontractor on each Force Account item established.

The payments provided above shall be full payment for all Work done on a Force Account basis. The calculated payment shall cover all expenses of every nature, kind and description, including those listed above and any others incurred on the Work being paid through Force Account. Nothing in this provision shall preclude the Contractor from seeking an extension of time or time-related damages to unchanged Work arising as a result of Force Account Work. The amount and costs of any work to be paid by Force Account shall be computed by the Owner's Representative and the result shall be final as provided in **3.2 OWNER'S REPRESENTATIVE**.

An item that has been bid at a unit price or lump sum in the Bid will not be paid as Force Account unless a change, as defined in **ARTICLE 6. CHANGES**, has occurred and the provisions require a payment adjustment. Items which are included in the Bid as Force Account or which are added by change order as Force Account may, by agreement of the parties at any time, be converted to agreed unit prices or lump sums applicable to the remaining Work.

9.7. RETAINAGE

Pursuant to RCW Chap. 60.28, a sum of five percent (5%) of the monies earned by the Contractor will be retained from progress estimates. In addition to protecting the interests of those identified in RCW Chap. 60.28, such retainage shall be used as a trust fund for the protection of the Owner.

At the option of the Contractor; monies retained under the provisions of RCW 60.28 shall be:

1. Retained in a fund by the Owner, or
2. Deposited by the Owner in an escrow (interest-bearing) account in a bank, mutual saving bank, or savings and loan association (interest on monies so retained shall be paid to the Contractor). Deposits are to be in the name of the Owner and may not be withdrawn without the Owner's written authorization. The Owner will issue a check representing the sum of the monies reserved, payable to the bank or trust company. Such check shall be converted into bonds and securities chosen by the Contractor as the interest accrues. Bank and Contractor will execute an escrow agreement in the form provided by Owner.
3. Released after submission of fully executed retainage bond in the form provided by Owner.

The Contractor shall designate the option desired at the time the Contract is executed. If the Contractor chooses option 2 (deposit in escrow account), Contractor agrees to assume full responsibility to pay all costs that may accrue from escrow services, brokerage charges or both, and further agrees to assume all risks in connection with the investment of the retained percentages in securities. The City may also, at its option, accept a bond in lieu of retainage.

Retainage will be released when all of the following conditions are satisfied:

1. Sixty (60) days have elapsed following the completion of all Work specified in the Contract; and
2. The Contractor fulfilled all of all obligations of the Contractor under the Contract, including, but not limited to, the Contractor's furnishing all documentation required by Contract and law; and
3. A release has been obtained from the Washington State Department of Revenue; and
4. Affidavits of Wages Paid for the Contractor and all Subcontractors are on file with the Owner (RCW 39.12.040); and
5. A release has been obtained from the Washington State Department of Labor & Industries and the Washington State Employment Security Department; and

6. All claims, as provided by law, filed against the retainage have been resolved. In the event claims are filed and provided the conditions one through five are met, the Contractor will be paid the retained percentage less an amount sufficient to pay any such claims together with a sum determined by the Owner sufficient to pay the cost of claims and attorney's fees.
7. All other conditions required by law are satisfied.

10. NOTICE TO OWNER

10.1 WHEN NOTICE MUST BE GIVEN

Whenever

1. The Contractor disagrees with any requirement, direction, interpretation or determination by the Owner or Owner's Representative;
2. The Contractor knows, or should with the reasonable exercise of ordinary care know, of a differing site condition as provided in **11. DIFFERING SITE CONDITIONS**;
3. The Contractor knows, or should with the reasonable exercise of ordinary care know, of any Delay or an event that may cause a Delay;
4. The Contractor believes, or with the reasonable exercise of ordinary care should believe, it is entitled to an adjustment of Contract Sum or Time, even if the total or exact amount or impact cannot yet be determined;
5. The Contractor believes it is required or directed to perform work that is outside the scope of the Contract Documents; or
6. An event occurs, or fails to occur, that the Contractor believes, or should reasonably foresee, may result in a Contract Claim;

the Contractor shall immediately give Notice to the Owner or Owner's Representative as provided in this section and elsewhere in the General Conditions and Specifications.

Timely and adequate Notice is a condition precedent to a Contract Claim.

Requests for extensions of Contract Time must be made and will be evaluated in accordance with **5.2.2.2 Extensions of Contract Time**.

Irrespective of any request for additional compensation or Contract Time or any Contract Claim that work is extra and not part of the original scope of Work, the Contractor shall proceed expeditiously and promptly with the work as the Owner orders.

If the Contractor fails to follow the procedures of this Contract, including failing to give Notice, the Contractor completely waives such Contract Claim. In its sole discretion, the Owner may waive strict compliance with procedures, but any such waiver of one or more items or elements does not waive the necessity for Contractor's strict compliance with any other item or element, nor shall such waiver be admissible in any legal proceeding for any reason.

10.2 FORM OF NOTICE

The Notice must include the following minimum information:

1. A complete and accurate description of the event or events giving rise to the Notice, including dates, times, and locations;
2. A preliminary list of persons of involved in such event;
3. A statement whether the Contractor believes the event may result in a Contract Claim for additional Contract Time or adjustment of the Contract Sum;

4. A date by which Contractor shall begin providing Supplemental Information as provided in this section.

10.3 SUPPLEMENTAL INFORMATION

Contractor shall supplement the written Notice as soon as possible with a written statement providing the following:

1. The date of the event, incident, direction, and other pertinent information;
2. The nature and circumstances giving rise to the Notice;
3. The Contract provisions relating to, but not limited to, the event, incident, and direction;
4. The estimated dollar cost, if any, of the Extra Work, or Delay, or both and how that estimate was determined; and
5. An analysis of the schedule showing the schedule change or disruption if the Contractor is asserting a schedule change or disruption.

Throughout any work related to a Notice, the Contractor shall keep complete and accurate records of costs, expenses, and time incurred for which Contractor will or may seek an adjustment. Contractor waives and is stopped from seeking an adjustment of Contract Sum or Contract Time where Contractor fails to keep and maintain cost, timekeeping, and scheduling records segregated and contemporaneously allocated to the subject work for which an adjustment is sought. For example, failure to keep contemporaneous labor and equipment time records specifically and only allocated to each item of claimed Extra Work shall constitute a waiver of any Contract Claim for reimbursement or additional Contract Time for each such item of Extra Work. The Contractor shall permit the Owner access to these and any other records needed for evaluating requests for additional Contract Time or Contract Sum.

11. DIFFERING SITE CONDITIONS

Upon discovery and before such conditions are disturbed, the Contractor shall promptly provide Notice to the City's Representative of:

1. Pre-existing subsurface or latent physical conditions at the site differing materially from those indicated in this Contract, or
2. Pre-existing unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this Contract.

Upon written request, the City's Representative shall determine whether the actual conditions encountered by the Contractor conditions are materially different and, if so, are the cause of a material increase or decrease in the Contractor's cost of performance of the Work, or extend the duration of the critical path of the schedule. Upon such determination, the City's Representative will make an adjustment of Contract Sum or Contract Time, as appropriate. Extensions of Contract Time will be evaluated in accordance with **5.2.2.2 Extensions of Contract Time**.

The City's Representative's determination that differing site conditions do not exist and/or the appropriate adjustment in Contract Sum or Contract Time (if any) shall be final. If there is a decrease in the cost or time required to perform the Work, failure of the Contractor to notify the City's Representative of the differing site condition shall not affect the City's right to make an adjustment in the Contract Sum or Contract Time. Additionally, no Contract Claim or adjustment of Contract Sum or Contract Time shall be allowed unless the Contractor has followed the procedures provided for in this Contract, including, but not limited to, furnishing timely Notice of the event and its effect on Contract Time and Contract Sum as required herein.

Contractor shall in no event be entitled to a Contract Claim or adjustment of Contract Sum or Contract Time based on an allegation that the pre-existing subsurface or latent physical conditions at the site differ materially from those indicated in this Contract unless Contractor establishes that it reasonably relied on the conditions indicated in this Contract when making its bid, that the actual conditions encountered on the site differed materially from those indicated in this Contract, and that such materially-different conditions were not foreseeable at the time of its bid.

12. CONTRACT CLAIMS

12.1 GENERAL

If the Contractor requests or believes for any reason that it is entitled to an adjustment of Contract Sum or Contract Time, or if the Contractor has a Dispute with the Owner and wants the Owner to take some action, or refrain from taking action, the Contractor shall file a Contract Claim as provided in this section. A timely and complete Contract Claim is a condition precedent to any entitlement by the Contractor to an adjustment of Contract Sum or Contract Time. No Contract Claim shall be allowed unless the Contractor has given Notice as required by **10. NOTICE TO OWNER** and/or **11. DIFFERING SITE CONDITIONS** and otherwise fully complies with the requirements of this section **12. CONTRACT CLAIMS**. The Contractor waives any Contract Claim if: (a) Notice was not timely given in accordance with the requirements of **10. NOTICE TO OWNER** and/or **11. DIFFERING SITE CONDITIONS**; (b) the Owner's Representative is not afforded reasonable access by the Contractor to complete records, including, but not limited to, correspondence, job diaries, and actual cost and additional time incurred; (c) a Contract Claim is not timely filed as required by the General Conditions; or (d) adequate, accurate, contemporaneous and segregated supporting time and expense records are not kept and maintained. The fact that the Contractor provided proper and timely Notice, provided a properly filed Contract Claim, or provided the Owner's Representative access to records of actual cost, shall not in any way be construed as proving or substantiating the validity of the Contract Claim. If the Owner determines the Contract Claim has merit in whole or in part, the Owner's Representative will make an adjustment of Contract Sum or Contract Time required for the work, or both. If the Owner's Representative finds the Contract Claim to be without merit, no adjustment will be made.

The Contractor shall keep full, complete, accurate and contemporaneous records of the costs and additional time incurred for any alleged Contract Claim. The Contractor shall permit the Owner's Representative to have access to those records and any other records as may be required by the Owner's Representative to determine the facts or contentions involved in the Contract Claim. Owner is not obligated to respond to a Contract Claim unless the Contractor is in full compliance with all the provisions of the General Conditions and the formal Contract Claim document has been submitted.

Full compliance by the Contractor with the provisions of this section 12 is a contractual condition precedent to the Contractor's right to sue or seek any recovery against the Owner in any legal proceeding.

12.2 CONTENTS

All Contract Claims filed by the Contractor shall be in writing, verified under penalty of perjury by an officer or principal of the Contractor, and in sufficient detail to enable the Owner's Representative to ascertain the basis and amount of the Contract Claim. All Contract Claims shall be submitted to the Owner's Representative. At a minimum, each Contract Claim must include:

1. A detailed factual statement of the Contract Claim for an adjustment of the Contract Sum or Contract Time, if any, providing all necessary dates, locations, and items of work affected by the Contract Claim.
2. The dates of all facts related to the Contract Claim.
3. The name of each Owner's individual, official, or employee involved in or knowledgeable about the Contract Claim.
4. The specific provisions of the Contract that support the Contract Claim and a statement of the reasons why such provisions support the Contract Claim.
5. If the Contract Claim relates to a decision of the Owner's Representative that the Contract leaves to the Owner's Representative's discretion or as to which the Contract provides that the Owner Representative's decision is final, the Contractor shall set out in detail all facts supporting its position relating to the decision of the Owner's Representative.
6. Identification of any documents and the substance of any oral communications that support the Contract Claim.
7. Copies of any identified documents that support the Contract Claim, other than Owner documents and documents previously furnished to the Owner by the Contractor. Standard industry manuals may be incorporated by reference.
8. If Contractor seeks an extension of Contract Time:
    a. The specific amount of time (including days and dates) sought.
    b. The specific reasons the Contractor believes an extension of Contract Time should be granted, including, but not limited to, compliance with the requirements of **5.2.2.2 Extensions of Contract Time**; and
    c. The specific provisions of the Contract Documents under which it is sought.
9. If Contractor seeks an increase in the Contract Sum, the exact amount sought and a breakdown of that amount into the following categories:
    a. Labor
    b. Materials
    c. Direct Equipment. The actual cost for each piece of equipment for which a Contract Claim is made or in the absence of actual cost, the rates established by the AGC/WSDOT Equipment Rental Agreement that was in effect when the work was performed. In no case shall the amounts sought or paid for each piece of equipment exceed the rates established by the Equipment Rental Agreement even if the actual cost for such equipment is higher. The Owner may audit the Contractor's cost records to determine actual equipment cost. The following information shall be provided for each piece of equipment:
        i. Detailed description (e.g., Motor Grader Diesel Powered Caterpillar 12 "G", Tractor Crawler ROPS & Dozer Included Diesel)
        ii. The hours of use or standby; and
        iii. The specific day and dates of use or standby;
        iv. Job Overhead.
        v. Overhead (general and administrative).
        vi. Subcontractor's contract claims (in the same level of detail as specified herein is required for all Subcontractor's contract claims); and

vii. Other categories as specified by the Contractor or the Owner.

10. A notarized statement shall be submitted to the Owner's Representative containing the following language:

Under the penalty of law for perjury or falsification, the undersigned,

_____, _____
(name) (title)
of _____
(company)
hereby certifies that the Contract Claim for an adjustment to the Contract Sum and/or Contract Time, if any, made herein for Work on this Contract is a true and complete statement of the factual basis of the Contract Claim and all actual costs incurred and time sought, and is fully documented and supported under the Contract between the parties.

Date_____/s/ _____
Subscribed and sworn before me this _____ day of _____
Notary Public
My Commission Expires: _____

12.3 FALSE OR OMITTED INFORMATION

The Contractor waives each Contract Claim for which it presents material information that it knows, or in the exercise of reasonable care should know, is false, or omits or fails to disclose material information relating to such Contract Claim. In such case, Contractor shall reimburse the Owner for any and all fees and expenses incurred in investigating any such Contract Claim.

12.4 REMEDIES

12.4.1 General

If a Contract Claim has merit in whole or in part, then Contractor's sole remedies shall be those provided in this subsection. Contractor must timely and strictly comply with the requirements of **10. NOTICE TO OWNER**, **11. DIFFERING SITE CONDITIONS, 12. CONTRACT CLAIMS** and all other General Conditions relating to the Contract Claim. Adjustments to Contract Time shall be determined pursuant to **5.2.2.2 Extensions of Contract Time**. Failure to comply strictly and timely shall be deemed a waiver of the Contract Claim.

12.4.2 Extra Work

12.4.2.1 Adjustment of Contract Sum

If the Contractor is entitled to an adjustment of Contract Sum because of Extra Work, the adjustment shall be calculated and paid as provided in **9.5. ADJUSTMENT OF CONTRACT SUM**. This amount includes jobsite and home office Overheads for such Work, including any schedule delays relating to such Work. Therefore, no compensation in addition to that provided in **9.6. FORCE ACCOUNT** shall be paid for such things as extended Overhead or other costs or damages.

12.4.2.2 Extension of Contract Time

Extensions of Contract Time caused by Extra Work shall be determined as provided in **5.2.2.2 Extensions of Contract Time**.

12.4.3 Delays

12.4.3. Owner Caused Delay Unrelated to Extra Work

12.4.3.1.1 Adjustment of Contract Sum

If the Contractor is entitled to an adjustment of Contract Sum because of a Delay solely caused by the Owner that does not relate to Extra Work, Contractor shall only be compensated for the items below, less all funds paid pursuant to any change in the Contract Sum that contributed to the Delay:

1. Documented, incurred cost of nonproductive field supervision or labor extended because of the Delay;
2. Documented, incurred cost of home office supervision to attend jobsite meetings;
3. Documented, incurred cost of temporary facilities or equipment rental extended because of the Delay;
4. Documented, incurred cost of insurance extended because of the Delay;
5. General and administrative Overhead in an amount to be agreed upon, but not to exceed three percent (3%) of original Contract Sum divided by the Contract Time for each day of the Delay.

Owner shall not owe Contractor compensation for extended Overhead or other delay costs to the extent Contractor or anyone other than the City contributed to or is concurrently responsible for the Delay.

12.4.3.1.2 Adjustment of Contract Time

If the Contractor is entitled to an adjustment of Contract Time because of a Delay solely caused by the Owner that does not relate to Extra Work, Contractor shall be entitled to an adjustment of Contract Time to the extent the Delay increases the duration of the Project, as measured by the critical path and as demonstrated pursuant to the requirements of **5.2.2.2 Extensions of Contract Time**.

12.4.3.2 Contractor Caused Delay

If the Contractor is solely responsible for any Delay to any interim milestone, Substantial Completion, Physical Completion or the Completion Date, the Owner shall be entitled to liquidated or other damages as provided elsewhere in the Contract Documents. The Contractor accepts the risk of any Delays caused by strikes, work slowdowns, job actions and labor unrest of any kind. Contractor shall not be entitled to any increase in Contract Sum or Contract Time due to a Delay it caused.

12.4.3.3 Delays Concurrently Caused by Contractor and Owner

If the Owner and the Contractor cause a Delay concurrently, neither the Owner nor the Contractor shall be liable to the other except as provided herein.

12.4.3.3.1 Adjustment of Contract Sum

The Contractor shall not be entitled to any adjustment in Contract Sum for Delays concurrently caused by the Owner and the Contractor.

12.4.3.3.2 Adjustment of Contract Time

The Contractor shall be entitled to an extension of Contract Time for the Owner caused portion of any Delay concurrently caused by the Owner and Contractor to the extent the Owner caused the Delay to extend longer than if the Contractor had solely caused the Delay.

12.4.3.4 Third Party Caused Delays and Force Majeure

For the purposes of this section **12.4.3.4**, a "Force Majeure Event" is defined as earthquake, flood, pandemic (and governmental laws, regulations, requirements, and orders resulting therefrom), natural disasters, acts of war or acts of terrorism. Pandemic in the preceding sentence includes without limitation the COVID-19 / novel coronavirus (SARS-CoV-2) pandemic, which is the subject of the Governor's proclamation dated February 29, 2020, and subsequent proclamations.

For the purposes of this section **12.4.3.4**, a "Third Party" is defined as a third party for whom neither the Contractor nor the City is responsible.

12.4.3.4.1 Adjustment of Contract Sum

The Owner and the Contractor shall not be responsible to compensate each other financially for any Delay to the extent caused by a Third Party or a Force Majeure Event. A Delay caused by a utility's failure to provide service or relocate its lines (despite a timely request for such service or relocation) is an example of this kind of Delay for which neither the Contractor nor the Owner is financially responsible to the other. Mislocated utility lines or utility lines not located are another example of a Delay for which neither the Contractor nor the Owner is responsible to the other. However, the Contractor's failure to request a utility locate or relocation in a timely way is not, and any resulting Delay would be the responsibility of the Contractor. Because the Contractor is responsible for ordering materials and Equipment, Contractor shall not be entitled to an adjustment of Contract Time or Contract Sum due to Delays caused by the lack of materials or Equipment. A strike, job action, slowdown, work to rule, or other job action or labor dispute or problem is not a Delay caused by a Third Party for the purposes of section **12.4.3 Delays**.

12.4.3.4. 2 Adjustment of Contract Time

The Contractor shall be entitled to an extension of Contract Time for Delays to the extent caused by a Third Party or Force Majeure Event. Extension of Contract Time shall be determined pursuant to **5.2.2.2 Extensions of Contract Time**.

12.4.3.5 Extended or Unabsorbed Overhead

12.4.3.5.1 General

To present a request for additional compensation for Extended or Unabsorbed Overhead, the Contractor has the burden of keeping and maintaining accurate documentation to support any such claim. If the Contractor fails to provide or keep adequate financial data for an accurate and fair Eichleay calculation, Contractor waives and releases any claim for Unabsorbed or Extended Overhead. In presenting any claim under this section of the Contract, the Contractor agrees to provide to the Owner any and all financial data needed by the Owner, or its representative, to review, substantiate and evaluate any claim for Extended and/or Unabsorbed Home Office Overhead. Failure to provide the requested information shall constitute waiver by the Contractor.

If Contractor is entitled to an adjustment of Contract Sum for Unabsorbed or Extended Overhead, it shall be calculated as provided in **9.5.3. Unabsorbed and Extended Overhead**.

12.4.3.5.2 Elements

Contractor shall only be entitled to an adjustment of Contract Sum for Unabsorbed or Extended Overhead if it clearly and convincingly demonstrates all of the following:

1. The Owner solely caused a delay to the Completion Date as measured by analysis of the project duration by the critical path method pursuant to **5.2.2.2 Extensions of Contract Time**;

2. Because of such Delay, the Contractor was forced to suspend or significantly interrupt its performance so that it was on standby or idled, and the Owner required the Contractor to be ready to resume performance on short notice. Extended time of performance of Work, such as extensions caused by changes, inefficiencies, or Extra Work, does not constitute suspension or significant interruption of performance.
3. The Contractor could not and did not use resources, including but not limited to labor, materials and equipment, standing by or idled on this or any other project for any work during the period of delay;
4. The Contractor's Overhead costs did not materially vary from its usual seasonal Overhead costs during the period of delay; and
5. The Delay did not cause Overabsorbed Overhead in the period in which the delayed Work was completed.

12.4.3.5.2.1 Resources

To demonstrate the Contractor could not and did not use resources, including but not limited to labor, materials and equipment from this Project for any other work on this or any other project during the period of delay (**12.4.3.5.2**.(3)), the Contractor must:

a. Affirmatively represent and warrant that it did not perform substitute Work;
b. Identify the specific resources that were idled; and
c. Show that those resources did not, and could not, work on other contracts or projects during the Delay.

12.4.3.5.2.2 No Material Variations

To demonstrate the Contractor's Overhead costs did not materially vary from its usual seasonal Overhead costs during the period of delay (**12.4.3.5.2.**(4)), the Contractor must;

a. Affirmatively represent and warrant that the completion of the subject Work was extended and that such extension prevented the performance of other work during both the period of delay and the later period of time required to complete the extended Work,
b. Disclose the details of Contractor generated billings and Contractor Overhead Costs (as hereinafter defined) throughout the actual project performance. The details of such information should be no less than specific identification of the sources and amounts of revenue on no greater than a monthly basis and specific identification of the types and amounts of Contractor Overhead Costs on no greater than a monthly basis for the actual Project duration.

12.4.3.5.2.3 Overabsorbed Overhead

To demonstrate that it did not incur Overabsorbed Overhead in the period following the Delay (**12.4.3.5.2.**(5)), the Contractor must:

a. Affirmatively represent and warrant that completion of the delayed Work prevented the performance of other work;
b. Identify the critical resource unavailable for other work due to completion of the delayed Contract; and
c. Showing that unavailability of this critical resource precluded the performance of other work.

12.4.4 Inefficiencies

12.4.4.1 Adjustment of Contract Sum

To the extent Contractor is entitled to an increase in Contract Sum because of inefficiencies or impaired productivity, then compensation due, if any, shall be calculated as provided in **9.5. ADJUSTMENT OF CONTRACT SUM**. There is no entitlement to increase in Contract Sum for inefficiencies related to a Third Party or to a Force Majeure Event.

12.4.4.2 Adjustment of Contract Time

To the extent Contractor is entitled to an extension of Contract Time because of inefficiencies or impaired productivity, then the time extension, if any, shall be determined as provided in **5.2.2.2 Extensions of Contract Time**.

13. DISPUTES

13.1 RESOLUTION

When a Dispute occurs during a Contract, the Contractor shall pursue resolution through the Owner's Representative. The Contractor shall follow the procedure stated in **12. CONTRACT CLAIMS** herein and **5.2.2.2 Extensions of Contract Time** for issues regarding the schedule and Contract Time. Timely and adequate Notice is a condition precedent to a Contract Claim. Timely and complete submission of a Contract Claim is a condition precedent to any entitlement by the Contractor to an adjustment of Contract Sum or Contract Time. Unless waived by the Owner, mediation is a condition precedent to the filing of any lawsuit, action or proceeding that seeks to recover on a Contract Claim, whether in whole or in part.

13.2 CONTINUING THE WORK

Contractor shall carry on the Work and adhere to the schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of Disputes or disagreements, except as permitted by paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

14. TIME LIMITATIONS AND JURISDICTION

The parties intend that all Claims and Disputes be dealt with promptly and expeditiously when they arise. The parties intend that all Claims and Disputes be resolved quickly and expeditiously and desire to avoid claims and Disputes that relate back to events or Work occurring months before. The parties desire to avoid litigation and the costs and expense of Claims and Disputes at the end of the Project.

Any Contract Claim for adjustment of Contract Sum or Contract Time, or any Dispute or Contract Claim of any kind whatsoever, must be submitted, if at all, to the Owner or Owner’s Representative no later than thirty (30) days after Notice was first required to be given by the Contractor as provided in **ARTICLE 10. NOTICE TO OWNER**. Failure to submit a Contract Claim within the thirty (30) days of the date Notice was required pursuant to **ARTICLE 10. NOTICE TO OWNER** constitutes a complete waiver of and bar to the Contract Claim, and Contractor is estopped from later asserting a Contract Claim or seeking any relief or remedy relating to the Dispute for which it failed to submit a Claim.

Contractor may not sue, cross-claim, claim, or bring any action of any kind whatsoever against the Owner on any Contract Claim or Dispute after the expiration of one hundred eighty (180) days from Physical Completion.

Any alleged cause of action by Owner or Contractor as to any acts or failures to act occurring prior to Substantial Completion shall be deemed to have accrued in any and all events not later than such date of Substantial Completion.

15. LIABILITY AND INSURANCE

15.1 GENERAL

Contractor bears all risk of loss, casualty or damage to installed Work prior to Final Acceptance, irrespective of whether the Owner has taken possession of the Project in whole or in part and notwithstanding the existence or availability of insurance or the insurance coverages required by the Contract Documents.

15.2 BONDS

15.2.1 Payment and Performance Bonds

The Contractor shall provide a payment bond and a performance bond, each in the amount of 100 percent of the Contract Sum in the form required by the Contract. This bond shall serve as security for the faithful performance of the Work and as security for the faithful payment and satisfaction of the persons furnishing materials and performing labor on the Work. The bond shall be issued by a corporation duly and legally licensed to transact surety business in the State of Washington. Such bond shall remain in force throughout the period required to complete the Work, and thereafter for a period of three hundred sixty-five (365) calendar days after Final Acceptance. The bond must be executed by a duly licensed surety company, which is listed in the latest Circular 570 of the United States Treasury Department, as being acceptable as surety on federal bonds. No surety's liability on the bond shall exceed the underwriting limitations for the respective surety specified in Circular 570. The scope of the bond or the form thereof prescribed in these Contract Documents shall in no way affect or alter the liabilities of the Contractor to the Owner as set forth herein.

15.2.2 Maintenance Bond

The Contractor shall, prior to the release of Final Payment, furnish separate Maintenance (or Guarantee) Bonds in form acceptable to the Owner written by the same corporate surety that provides the Payment and Performance Bond for this Contract. These bonds shall secure the Contractor's obligation to replace or repair defective materials and faulty workmanship for a minimum period of one (1) year after Final Payment and shall be written in an amount equal to one hundred percent (100%) of the Contract Sum, as adjusted (if at all).

15.3 INSURANCE

15.3.1 General

The Contractor shall obtain and keep in force during the term of the Contract and until thirty (30) days after the Completion Date, unless otherwise indicated below, the following insurance with insurance companies or through sources approved by the State Insurance Commissioner pursuant to Title 48 RCW.

15.3.2 Insurer Rating

The insurance provided must be with an insurance company with a rating of A-: VII or higher in the A.M. Best’s Key Rating Guide, which is licensed to do business in the state of Washington (or issued as a surplus line by a Washington Surplus lines broker). The Owner reserves the right to approve the security of the insurance provided, the company, terms and coverage, and the Certificate of Insurance.

15.3.3 Claims Made Form Requirements

If any policy is written on a claims made form, the retroactive date shall be prior to or coincident with the effective date of this Contract. The policy shall state that coverage is claims made, and state the retroactive date. Claims made form coverage shall be maintained by the Contractor for a minimum of three years following the expiration or earlier termination of this Contract, and the Contractor shall annually provide the Owner with proof of renewal. If renewal of the claims made form of coverage becomes unavailable, or economically prohibitive, the Contractor shall purchase an extended reporting period ("tail") or execute another form of guarantee acceptable to the Owner to assure financial responsibility for liability for services performed.

15.3.4 Cross Liability Endorsement

The policies of insurance shall contain a “cross liability” endorsement substantially as follows:

> The inclusion of more than one insured under this policy shall not affect the rights of any insured as respects any claim, suit, or judgment made or brought by or for any other insured or by or for any employee of any other insured. This policy shall protect each insured in the same manner as though a separate policy had been issued to each, except that nothing herein shall operate to increase the company’s liability beyond the amount or amounts for which the company would have been liable had only one insured been named.

15.3.5 Additional Insured

All insurance policies, with the exception of Workers Compensation shall be endorsed to name the Owner, BHC Consultants, LLC and its subcontractors, and each of their respective officers, elected officials, employees, agents, and volunteers, and other entities specifically required by the Contract Documents, as additional insured(s). Such endorsement shall not limit the policy limits available to the Owner as additional insured to the coverage amounts required herein if the Contractor maintains larger policy limits.

15.3.6 Contractor Insurance Primary / Waiver of Subrogation

Contractor’s insurance shall be primary as respects the Owner, and any other insurance or self-insurance maintained by the Owner shall be excess and not contributing insurance with the Contractor’s insurance.

The Contractor waives all rights against the Owner and its separate contractors, and their agents and employees, for damages caused by fire or other perils to the extent such damage cost is actually paid by property insurance applicable to the Work. The Contractor shall require similar waivers from all Subcontractors.

15.3.7 Assumption of Risk

Contractor hereby assumes all risk of damage to its property, or injury to its officers, directors, agents, contractors, or invitees, in or about the Property from any cause, and hereby waives all claims against the Owner. The Contractor further waives, with respect to the Owner only, its immunity under RCW Title 51, Industrial Insurance.

15.3.8 Cost Included in Price

All costs for insurance shall be incidental to and included in the unit contract prices or lump sum price of the Contract and no additional payment will be made for required insurance.

15.3.9 Subcontractors

Contractor shall furnish separate evidence of insurance as stated above for each Subcontractor or shall include all Subcontractors as insureds under its policies. All coverage for Subcontractors shall be subject to all the requirements stated herein and applicable to their profession. If Contractor does not include Subcontractors as insured under Contractor’s own insurance policies, Contractor shall be responsible for assuring that all Subcontractors obtain all

insurance as required by this Agreement and that the Owner be specifically endorsed as an additional insured on such insurance.

15.3.10 No Work Until Insurance Requirements Met

Neither the Contractor nor any of its subcontractors shall begin work under the Contract until all required insurance has been obtained and approved by the Owner, irrespective of whether a Notice to Proceed has been issued. Working or calendar days will be charged against Contract Time from the date specified in the Notice to Proceed (or the date of the Notice to Proceed, if no start date is specified in the Notice to Proceed), and will not be suspended or not charged if insurance requirements are not fulfilled. Purchase of appropriate insurance and providing satisfactory evidence of required insurance is wholly the obligation of the Contractor, and any Delay that is not the fault of the Owner shall be attributed to the Contractor.

15.3.11 Failure to Procure and Maintain Insurance

Failure on the part of the Contractor to obtain, maintain and deliver the policy or policies (in whole or in part) and receipt or receipts as required shall constitute a material breach of Contract. After giving five (5) working days notice to the Contractor to correct the breach, the Owner may, in its sole discretion and option: (a) immediately terminate the Contract; (b) procure or renew such insurance and pay any and all premiums in connection therewith, with any sums so expended to be repaid to the Owner on demand, or, at the sole discretion of the Owner, offset against funds due the Contractor from the Owner; (c) withhold progress payments (in whole or in part); and (d) avail itself of any other remedy at law, in equity, or allowed by Contract. These remedies are cumulative and not exclusive. The Contractor hereby appoints the Owner its true and lawful attorney, to do the things necessary for the purpose of procuring or renewing insurance as provided herein. Failure of the Owner to obtain such insurance shall in no way relieve the Contractor of its responsibilities under this Contract.

15.3.12 Cancellation

The Owner shall be given at least thirty (30) days prior written Notice of any cancellation, non-renewal, or other material change in any insurance policy. Owner acknowledges that the Contractor's Worker's Compensation/Employer's Liability insurance cannot be endorsed or amended to provide the Owner with prior Notice of material changes.

15.3.13 Evidence of Insurance

The Contractor shall deliver the executed Contract for the Work to the Owner together with a Certificate(s) of Insurance and endorsements for each policy of insurance meeting the requirements set forth above. The certificate must conform to the following requirements:

1. An ACORD certificate Form 25-S, or equivalent, showing the insuring company, policy effective dates, limits of liability and the schedule of Forms and Endorsements.
2. A copy of either: (a) the endorsement naming Owner elected officials, officers, employees, agents, and volunteers and any other entities required by the Contract Documents as Additional Insured(s), and stating that coverage is primary and non-contributory, showing the policy number, and signed by an authorized representative of the insurance company on Form CG2010 (ISO) or equivalent; or (b) the blanket additional insured policy provision.
3. A copy of an endorsement stating that the coverage provided by this policy to the Owner or any other named insured shall not be canceled, not renewed or materially changed without providing at least thirty (30) days prior written Notice to the Owner.
4. The certificate(s) shall not contain the following or similar wording regarding cancellation notification to the Owner. "Failure to mail such Notice shall impose no obligation or liability of any kind upon the company."

5. The certificate(s) shall not contain the phrase “endeavor to”, or any substantially similar phrase, regarding issuance of written Notice of cancellation of the policies prior to their expiration dates.
6. The Description of Operations in the certificate must read as: “All policies of insurance, except workers compensation, are endorsed to name the City of Everett, its elected officials, officers, employees, agents, and volunteers as additional insured(s). All such insurance is primary as respects the City of Everett, and any other insurance maintained by the City of Everett is excess and not contributing. The City of Everett will be given at least thirty (30) days prior written notice of any cancellation, non-renewal, or other material change in any insurance policy.”

Within ten (10) days upon Owner’s written request, the Contractor shall deliver to the Owner certified copies of all policies of insurance and the receipts for payment of premiums thereon. The Owner acknowledges that Contractor may pay its premium on a monthly basis, and may not be able to provide complete evidence of payment of premiums until the final premium is paid.

15.3.14 Coverages and Limits

The insurance shall provide the minimum coverages and limits set forth below. Owner does not warrant or represent that such coverages and limits are appropriate or adequate to protect the Contractor. Providing coverage in these stated minimum limits shall not be construed to relieve the Contractor from liability in excess of such limits. All deductibles must be disclosed and are subject to approval by the Owner. The cost of any claim payments falling within the deductible shall be the sole responsibility of the Contractor.

15.3.14.1 CGL

A policy of Commercial General Liability Insurance, written on an insurance industry standard occurrence form: (CG 00 01) or equivalent, including all the usual coverage known as:

- Per Project aggregate endorsement (CG2503)
- Premises/Operations Liability
- Products/Completed Operations – for a period of one year following Final Acceptance
- Personal/Advertising Injury
- Contractual Liability
- Independent Contractors Liability
- Stop Gap or Employers Contingent Liability
- Explosion, Collapse, or Underground (XCU), (as applicable)*
- Liquor Liability/Host Liquor Liability (as applicable)*
- Fire Damage Legal
- Blasting (as applicable)*

*These coverages are only required when the Contractor’s Work under this agreement includes exposures to which these specified coverage respond.

If the Contract requires working over water, the following additional coverages are required:

a. Watercraft, owned and non-owned
b. U.S. Harborworkers’/Longshoremen and Jones Act

15.3.14.2 Builders' Risk

The Contractor shall procure and maintain during the life of the Contract, or until acceptance of the project by Owner, whichever is longer, "All Risk" Builders Risk or Installation Floater Insurance at least as broad as ISO form number CP0020 (Builders Risk Coverage Form) with ISO form number CP0030 (Causes of Loss – Special Form) including coverage for collapse, theft, off-site storage and property in transit. The coverage shall insure for direct physical loss to property of the entire construction project, for 100% of the replacement value thereof and include earthquake. The policy shall be endorsed to cover the interests, as they may appear, of the Owner, Contractor and subcontractors of all tiers with the Owner and sub-contractors listed as a Named Insured. In the event of a loss to any or all of the work and/or materials therein and/or to be provided at any time prior to the final close-out of the Contract and acceptance of the project by the Owner, the Contractor shall promptly reconstruct, repair, replace or restore all work and/or materials so destroyed. Nothing herein provided for shall in any way excuse the Contractor or its surety from the obligation of furnishing all the required materials and completing the work in full compliance with the terms of the Contract.

15.3.14.3 Other Coverages

Other additional coverages that may be required will be listed in the Specifications.

15.3.14.4 Limits

Such policy(ies) must provide the following minimum limits:

Bodily Injury and Property Damage -

$ 5,000,000	General Aggregate
$ 2,000,000	Products & Completed Operations Aggregate
$ 2,000,000	Personal & Advertising Injury
$ 2,000,000	Each Occurrence
$ 100,000	Fire Damage

Stop Gap Employers Liability

$ 1,000,000	Each Accident
$ 1,000,000	Disease - Policy Limit
$ 1,000,000	Disease - Each Employee

A stop gap policy limit of $500,000 will be acceptable if, and only if, the Contractor Excess or Umbrella Liability policy required by **15.3.14.6 Excess or Umbrella Liability** provides coverage over the stop gap policy.

15.3.14.5 Automobile

Commercial Automobile Liability: as specified by Insurance Services Office, form number CA 0001, Symbol 1 (any auto), with an MCS 90 endorsement and a CA 9948 endorsement attached if "pollutants" as defined in exclusion 11 of the commercial auto policy are to be transported. Such policy(ies) must provide coverage with a combined single limit of not less than $1,000,000 for each accident.

15.3.14.6 Excess or Umbrella Liability

The limits stated in this section **15.3.14** may be satisfied by a combination of liability and, if necessary, commercial umbrella/excess policies.

15.3.14.7 Pollution Liability

A policy providing coverage for claims involving remediation, disposal, or other handling of pollutants arising out of Contractor's operations for others; contractors site (owned); arising from the transportation of hazardous materials; or involving remediation, abatement, repair, maintenance or other work with lead-based paint or materials containing asbestos.

Such Pollution Liability policy shall provide at least $2,000,000 per occurrence coverage for Bodily Injury and Property Damage.

15.3.14.8 Worker's Compensation

A policy of Worker's Compensation, as required by the Industrial Insurance Laws of the State of Washington. As respects Workers' Compensation insurance in the state of Washington, Contractor shall secure its liability for industrial injury to its employees in accordance with the provisions of RCW Title 51. If Contractor is qualified as a self-insurer in accordance with RCW 51.14, Contractor shall so certify by letter signed by a corporate officer indicating that it is a qualified self insured, and setting forth the limits of any policy of excess insurance covering its employees.

15.3.15 Self-Insurance

At its sole option and in its sole discretion, Owner may accept Contractor's self-insurance for a liability coverage in lieu of insurance from an insurer. Contractor must provide a letter from its Corporate Risk Manager, or appropriate Finance Officer representing and warranting the following minimum information: whether the self-insurance program is actuarially funded; the fund limits; any excess declaration pages to meet the Contract requirements; a description of how Contractor would protect and defend the Owner as an Additional Insured in their Self-Insured layer; and claims-handling directions in the event of a claim. Any amounts due to, sought by, or paid to third party claimants shall be the sole responsibility of the Contractor, irrespective of whether such amount falls wholly within the level or amount of the Contractor's self-insured retention.

16. LAWS, REGULATIONS AND PERMITS

16.1 GENERAL

The Contractor shall give the Notices required by law and comply with all laws, ordinances, rules and regulations pertaining to the conduct of the Work. The Contractor shall indemnify, defend, and save harmless the City (including its agents, officers, and employees) against any claims that may arise because the Contractor (or any employee of the Contractor or Subcontractor or material person) violated a legal requirement. The Contractor shall be liable for violations of same in connection with Work provided by the Contractor; and Contractor shall cooperate with all governmental entities regarding inspection of the Work and compliance with such requirements. If the Contractor observes that the Drawings, Specifications or other portions of the Contract Documents are at variance with any laws, ordinances, rules or regulations, he or she shall promptly notify the Owner's Representative in writing of such variance. The Owner will promptly review the matter and, if necessary, take appropriate action. Contractor agrees not to perform Work it knows, or in the exercise of ordinary care should know, to be contrary to any laws, ordinances, rules or regulations.

16.2 PERMITS AND LICENSES

Unless otherwise specified, permits and licenses from governmental agencies, which are necessary only for and during the prosecution of the Work and the subsequent guarantee period, shall be secured by the Contractor and paid for by the Owner. Permits and licenses of

regulatory agencies that are necessary to be maintained after expiration of the guarantee period will be secured and paid for by the Owner.

The City of Everett Utilities Department has reviewed and commented on the Drawings in this Contract.

If an erosion control plan is required, the Contractor shall submit an erosion control plan that depicts the best management practices that will be followed for erosion control. The Contractor may use the plans in this Contract. The fee for this permit will be waived by the City of Everett.

Electrical permits can be obtained at:

City of Everett
3200 Cedar Street – 2nd Floor
Everett, WA 98201
Phone: 425/257-8800

16.3 PATENTS AND ROYALTIES

Costs involved in fees, royalties, or claims for any patented invention, article, process or method that may be used upon or in a manner connected with the Work under this Contract or with use of completed Work by the Owner shall be paid by the Contractor. The Contractor and its sureties shall protect and hold the Owner, Owner's Representative, and Owner's Representative, together with its officers, agents, and employees, harmless from any and all loss, defense cost, and expenses and against any and all demands made for such fees or claims brought or made by the holder of any invention or patent. Before final payment is made on the account of this Contract, the Contractor shall, if requested by the Owner, furnish acceptable proof of a proper release from all such fees or claims.

Should the Contractor, its agent, employee or any of them be enjoined from furnishing or using any invention, article, material or plans supplied or required to be supplied or used under this Contract, Contractor shall promptly pay such royalties and secure requisite licenses; or, subject to acceptance by Owner, substitute other articles, materials, or appliances in lieu thereof that are of equal efficiency, quality, finish, suitability and market value to those planned or required under the Contract. Descriptive information of these substitutions shall be submitted to the Owner's Representative for determination of general conformance to the design concept and the construction Contract. Should Owner elect to refuse the substitution, Contractor agrees to pay such royalties and secure such valid licenses as may be requisite for the Owner, its officers, agents and employees or any of them, to use such invention, article, material or appliance without being disturbed or in any way interfered with by any proceeding in law or equity on account thereof.

17. AUDITS

17.1 GENERAL

The Contractor's records relating to this Project, including, but not limited to, wage, payroll, and cost records, shall be open to inspection or audit by representatives of the Owner during the Project and for a period of not less than six years after the date of Final Acceptance of the Contract. The Contractor shall retain these records for that period. The Contractor shall also guarantee that Project records of Subcontractors, Suppliers, and lower tier Subcontractors, including, but not limited to, the wage, payroll, and cost records, shall be retained and open to similar inspection or audit for the same period of time. The audit may be performed by employees or representatives of the Owner or by an auditor chosen by the Owner. The Contractor, Subcontractors, or lower tier Subcontractors shall provide adequate facilities, reasonably acceptable to auditor, for the audit during normal business hours. The Contractor,

Subcontractors, or lower tier Subcontractors shall make a good faith effort to cooperate with the auditors. If an audit is to be commenced more than sixty (60) days after the Final Acceptance date of the Contract, the Contractor will be given twenty (20) days' notice of the time when the audit is to begin. If any litigation, claim, or audit arising out of, in connection with, or related to this Contract is initiated, the Project records shall be retained until the later of (a) completion of litigation, claim, or audit or (b) six years after the date of Final Acceptance.

17.2 CLAIMS

All Contract Claims filed against the Owner shall be subject to audit at any time following the filing of the Contract Claim. Failure of the Contractor, Subcontractors, or lower tier Subcontractors to maintain and retain sufficient records to allow the auditors to verify all or a portion of the Contract Claim or to permit the auditor access to the books and records of the Contractor, Subcontractors, or lower tier Subcontractors shall constitute a waiver of a Contract Claim and shall bar any recovery thereunder.

17.3 REQUIRED DOCUMENTATION FOR AUDITS

As a minimum, the auditors shall have available to them the following documents:

Daily time sheets and supervisor's daily reports.

Collective Bargaining Agreements.

Insurance, welfare, and benefit records.

Payroll registers.

Earnings records.

Payroll tax forms.

Material invoices and requisitions.

Material cost distribution worksheet.

Equipment records (list of company equipment, rates, etc.)

Vendors', rental agencies', Subcontractors' and lower tier Subcontractors' invoices.

Contracts between the Contractor and each of its Subcontractors, and all lower tier Subcontractor contracts and Supplier contracts.

Subcontractors' and lower tier Subcontractors' payment certificates.

Canceled checks (payroll and vendors).

Job cost reports, including monthly totals.

Job payroll ledger.

General ledger.

Cash disbursements journal.

Financial statements for all years reflecting the operations on this Contract. In addition, the Owner may require, if it deems appropriate, additional financial statements for 3 years preceding execution of the Contract and 3 years following Final Acceptance of the Contract.

Depreciation records on all company equipment whether these records are maintained by the company involved, its accountant, or others.

If a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all

such other source documents which support the amount of damages as to each Contract Claim.

Worksheets or software used to prepare the Contract Claim establishing the cost components for items of the Contract Claim including but not limited to labor, benefits and insurance, materials, equipment, Subcontractors, all documents which establish the time periods, individuals involved, the hours for the individuals, and the rates for the individuals.

Worksheets, software, and all other documents used by the Contractor to prepare its Bid. The employees or representatives of the Owner may audit these documents. The Contractor and its Subcontractors shall provide adequate facilities acceptable to the Owner for the audit during normal business hours. The Contractor and all Subcontractors shall cooperate with the Owner's auditors.

Correspondence, notes, and memoranda.

Job diaries.

18. MISCELLANEOUS

18.1 CONSTRUCTION

Contractor acknowledges that it has read the Contract Documents, understands them and agrees to be bound by them.

18.2 APPLICABLE LAW AND CHOICE OF FORUM

This Contract and the parties' obligations hereunder shall be governed, construed, and enforced in accordance with the laws of the State of Washington. The parties agree that Snohomish County, in the State of Washington, shall be the proper forum for any action.

18.3 SEVERABILITY

In the event that any provision of the Contract Documents is held invalid, void, illegal or unenforceable, the remainder of the Contract Documents shall not be impaired or affected thereby, and each term, provision, and part shall continue in full force and effect.

18.4 HEADINGS FOR CONVENIENCE

The section and subsection headings used herein are for referral and convenience only, and shall not be used to construe or interpret the Contract Documents.

18.5 WAIVER

No waiver of one right or remedy shall act as a waiver of any other right or remedy or as a subsequent waiver of the same right or remedy. The waiver by either party of any term or condition of this Contract shall not be deemed to constitute a continuing waiver thereof nor of any further or additional right that such party may hold under this Contract.

18.6 CITY OF EVERETT BUSINESS LICENSE

Contractor agrees to obtain a City of Everett business license prior to performing any Work pursuant to this Contract.

18.7 COMPLIANCE WITH FEDERAL, STATE AND LOCAL LAWS

Contractor shall comply with and obey all federal, state and local laws, regulations, and ordinances applicable to the operation of its business and to its performance of Work hereunder. If, and to the extent, this Contract receives financial assistance from federal, state or private agencies, Contractor shall comply with all terms and conditions prescribed for third party

contracts in the grant and all said terms and conditions shall be deemed incorporated in the Contract Documents. Terms and conditions of any such grant take precedence over conflicting terms and conditions in the Contract Documents.

Title VI Assurance

a. The Contractor, with regard to the Work performed during the Contract, shall not discriminate on the grounds of race, color, sex or national origin in the selection and retention of Subcontractors, including procurement of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in such discrimination, including discrimination in employment practices.

b. In all solicitations either by competitive bidding or negotiations made by the Contractor for Work to be performed under a subcontract, including procurement of materials or leases of equipment, each potential Subcontractor or suppler shall be notified by the Contractor of the Contractor's obligations under this Contract.

c. The Contractor shall provide all information and reports required by federal regulations applicable to this Contract. The Contractor shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Owner to be pertinent to ascertain compliance with applicable federal regulations. Where any information required of a Contractor is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the Owner, and shall set forth what efforts it has made to obtain the information.

d. In the event of the Contractor's noncompliance with the nondiscrimination provisions of this Contract, the Owner shall impose such Contract sanctions as it, or the Owner's funding agencies, may determine to be appropriate, including, but not limited to: (a) withholding of payments to the Contractor until the Contractor complies, and (b) termination or suspension of the Contract, in whole or in part.

e. The Contractor shall include the provisions of paragraphs (a) through (e) in every subcontract, including contracts for procurement and leases of equipment, unless exempt by applicable federal regulations or directives issued pursuant thereto. The Contractor shall take such action, including sanctions for noncompliance, with respect to any Subcontractor as the Owner or relevant federal agency may direct so as to enforce such provisions. Provided, however, in the event a Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or Supplier as a result of the foregoing direction, the Contractor may request that the Owner or the United States to enter into such litigation to protect their respective interests.

18.8 COMPLETE AGREEMENT

These Contract Documents contain the complete and integrated understanding and agreement between the parties and supersedes any understanding, agreement or negotiation, whether oral or written, not set forth herein.

18.9 SUCCESSORS BOUND

The grants, covenants, provisions and claims, rights, powers, privileges and liabilities contained in the Contract Documents shall be read and held as made by and with, and granted to and imposed upon, the Contractor and the Owner and their respective heirs, executors, administrators, successors and assigns.

18.10 EFFECTIVE DATE

When duly executed by both the Owner and Contractor, this Contract shall be effective as of the date the Contract (Section 00 52 13) is signed by the Mayor of the City of Everett. There is no contract formed until the Effective Date.

18.11 CONTRACTOR REGISTRATION

Contractor represents and warrants it is a contractor duly registered and in good standing with the Washington State Department of Labor and Industries.

END OF SECTION 00 72 00

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SECTION 00 73 43
WAGE RATE REQUIREMENTS

PART 1 : GENERAL

1.01 SPECIFICATION REFERENCE

A. Section 00 72 00 - GENERAL CONDITIONS, Part 7.1 “Wages of Employees”.

1.02 WORK LOCATION

A. All Work performed within Snohomish County, WA.

1.03 PREVAILING WAGE REQUIREMENTS

A. Contractor agrees to comply with all state and federal laws relating to the employment of labor and wage rates to be paid. The hourly wages to be paid to laborers, workers, or mechanics shall be not less than the prevailing rate of wage for an hour’s work in the same trade or occupation in Snohomish County.

1. Washington State Prevailing Wage Rates for Snohomish County, effective 07/09/2024; Benefit Code Key, effective 03/02/2024 through 08/30/2024 are, by reference, made a part of this Contract.
2. Prevailing wage rates can be accessed at the following URL: https://www.lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates
3. Printed copies of the current prevailing wage forms are available upon request.

B. In the preparation of its Bid, based on these Specifications, the Bidder is solely responsible to:

1. Use the schedule in effect at the time of the Bid Opening Date and time,
2. Determine the appropriate labor classification(s); and
3. Utilize the appropriate and correct prevailing wage and benefit rate(s).

C. No payment will be made on this Contract until the Contractor and each Subcontractor has submitted a “Statement of Intent to Pay Prevailing Wages”, form F700-029-000, which has been approved by the industrial statistician of the Department of Labor and Industries.

D. No final payment or release of retainage will be made until the Contractor and each Subcontractor has submitted an “Affidavit of Wages Paid”, form F700-007-000, which has been certified by the industrial statistician of the Department of Labor and Industries.

E. Post the prevailing rate of wage statement in a location readily visible to workers at the job site, or as allowed by RCW 39.12.020. The “Statement of Intent to Pay Prevailing Wages” shall include:

1. Contractor's registration certificate number and
2. Prevailing rate of wage for each classification of workers entitled to prevailing wages under RCW 36.12.020 and the estimated number of workers in each classification.

END OF SECTION 00 73 43

SECTION 01 11 00
SUMMARY OF WORK

PART 1 : GENERAL

1.01 SUMMARY

A. The Work specified for this contract consists of furnishing all labor, materials, tools, and equipment necessary for the construction and installation of new and existing air blowers, compressor, and electrical and control equipment in a new pre-engineered metal building. The work generally includes, but shall not be limited to the following:

1. Construct a pre-engineered metal building to house two (2) air blowers, an air compressor, dry-type transformer, control panel, two (2) variable frequency drives (VFDs), and a panelboard. The building size is approximately 24'x 30' (interior dimensions), with an 18-foot wide by 12-foot-high rollup door and a single 36-inch door. An on-grade concrete foundation will support the building. The new building is approximately 5 feet from the existing blower building.
2. Install a new air blower and relocate the existing air blower from the current blower building to the new blower building. The blowers are variable speed units with 200 HP motors, and with a capacity of approximately 3,825 standard cubic feet per minute. The new blower has been sized and selected by the City. Connect the air blower piping from the blowers to the air piping outside the main Water Filtration Plant (WFP) building.
3. Install a new duplex instrumentation-grade air compressor system to provide redundancy with the existing compressor unit located inside the main WFP building. This compressor system provides instrumentation-grade air for the pneumatic valve actuators used to regulate the filter plant operations. The compressor unit will be purchased by the City and will be delivered prior to construction for installation by the Contractor. The compressor system package includes two (2) compressor units, air receiver, pressure regulator, compressor controls, filtration, drying system, and oil mist eliminator with a nominal rated output pressure of 125 pounds per square inch (psi). The new compressed air piping from the compressor connects with the existing piping inside the main WFP building.
4. Install a new motor control center (MCC) with a 480-volt panel and individually mounted VFDs.
5. Transfer the existing blower control panel from the current blower building to the new blower building.
6. Transfer the existing fiber optic termination cabinet from the current blower building to the new blower building and install new fiber optic cables.
7. Provide electrical service to the new building by connecting to an existing transformer near the building.

8. Provide ventilation for the new building.
9. Provide site improvements, such as drainage piping and crushed surfacing top course.

1.02 SUBMITTALS

A. Prior to mobilization the following submittals shall be submitted to the City for review and approval.

1. Contractor's Spill Prevention, Control, and Countermeasure (SPCC) Plan, see Section 01 50 00 - Temporary Facilities and Controls.
2. Health and Safety Plan (specific to this project), see Section 01 35 29.

B. Prior to construction, the following submittals must be submitted to the City for review and approval. Other submittals may be required and are listed in other sections of these specifications.

1. Construction Plan – See 1.03.D below.
2. Subcontractors List.
3. Schedule of Values – see Section 01 29 73.
4. Project Schedule – see Section 01 32 16.
5. Other submittals per Section 01 33 00.

1.03 CONTRACTOR'S USE OF SITE AND PREMISES

A. The Contractor shall assume full responsibility for protection and safekeeping of products under this Contract.

B. The Contractor shall obtain and pay for use of any additional parking, storage, or work areas needed for his/her operations.

C. The Contractor shall limit the construction activities to the areas indicated on the Drawings.

D. Construction Plan: Before the start of construction, provide a construction plan regarding access to Work, use of Site, proposed laydown areas and utility outages for acceptance by the City. After acceptance of the plan, construction operations shall comply with the accepted plan unless deviations are accepted by the City in writing.

E. The project is located within the City of Everett's Water Filtration Plant and all City operations shall not be impeded by the construction activities of this project.

1.04 WORK HOURS

A. Contractor will be required to provide a project schedule that clearly defines each phase of work and the work hours associated with each phase.

B. The Work site is available from 0600 – 1730 during the work week (M-F) excluding City observed holidays unless otherwise approved by the City's Project Manager. Any additional or alternate work hours will require advance approval

and coordination with the City's Project Manager.

1.05 WORK SEQUENCE

A. Work in stages in order to accommodate the City's use requirements during the construction period. Coordinate construction schedule and operations with the City.

1.06 PERMITS

A. The Contractor shall be responsible to obtain and pay the cost of any applicable permits required to do the Work, and such costs shall be included in their Bid.

1.07 WORK BY OTHERS

A. The Contractor is required to coordinate all their activities with the City's Project Manager, or his/her designee. The City will have other construction projects in progress at the Water Filtration Plant site during the duration of this project and it is the Contractor's responsibility to assure that adequate notice is given to the City's Project Manager regarding equipment or materials that may need to be relocated in order to perform the work.

1.08 WORK BY THE OWNER

A. The City shall have the right to access the site 24/7 and execute work not included in this Contract and concurrent with the contract period. The Contractor shall cooperate with such City sponsored efforts.

B. The Contractor shall coordinate with the City in scheduling operations to minimize conflict with concurrent construction projects, plant operations and maintenance activities.

1.09 CODES AND STANDARD SPECIFICATIONS

A. All construction shall be in accordance with the International Building Code, Current Adopted Edition.

B. All construction shall be in accordance with the Uniform Mechanical Code, and the Uniform Plumbing Code, latest editions.

C. All construction shall be in conformance with the WSDOT/APWA Standard Specifications and Standard Plans, latest editions.

D. All construction shall be in conformance with the City of Everett Design and Construction Standards and Specifications, latest edition.

E. All work shall comply with applicable requirements of Snohomish County.

F. Any material specified by reference to the number, symbol, or title of a specified standards, such as Commercial Standard Federal Specifications, a trade association standard, or other similar standard, shall comply with the requirements of the latest revision thereof, and any amendment or supplement

thereto in effect on the date of Invitation for Bids, except as limited to type, class or grade, or modified in such references. All work shall conform to the standard referred to, except as modified in these specifications and the Drawings.

1.10 CHECKING DRAWINGS AND SPECIFICATIONS

A. Prior Submission of Bids: The Contractor shall report any discrepancies or omissions in the Drawings and/or specifications to the Engineer for a decision prior to the Submission of Bids.

B. Resolution of Conflicts: Where there is conflict between the Drawings and the specifications in regard to materials, equipment, sizes, numbers or locations, the Owner shall be the sole judge in resolving the conflict.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 11 00

SECTION 01 22 20
MEASUREMENT AND PAYMENT

PART 1 : GENERAL

1.01 SUMMARY

A. This Section describes the methods of measurement, what Work is included under each bid item, and incidental Work incidental.

B. Washington State Department of Transportation Standard Specifications, Latest Edition, Section 1-09, Section 00 72 00 - General Conditions of the Project Specifications, and this Section provides the measurement and payment requirements.

1.02 SUBMITTALS

A. Informational Submittals:

1. Schedule of Values: Submit on Contractor's standard form.
2. Schedule of Estimated Progress Payments:
    a. Submit with initially acceptable Schedule of Values.
    b. Submit adjustments thereto with Application for Payment.
3. Application for Payment.
4. Final Application for Payment.

1.03 SCHEDULE OF VALUES

A. Prepare a separate Schedule of Values for each schedule of the Work under the Agreement.

B. Upon request of Engineer, provide documentation to support the accuracy of the Schedule of Values.

C. Lump Sum Work:

1. Reflect specified allowances and alternates, as applicable.
2. List bonds and insurance premiums, mobilization, demobilization, preliminary and detailed progress schedule preparation, equipment testing, facility startup, and contract closeout separately.
    a. Mobilization includes, at minimum, items identified in Paragraph 1.10 of this Section.
    b. Include item(s) for monthly progress schedule update.

D. An unbalanced or front-end loaded schedule will not be acceptable.

E. Summation of the complete Schedule of Values representing all the Work shall equal the Contract Price.

F. Submit Schedule of Values via email in a spreadsheet format compatible with latest version of MS Excel.

1.04 SCHEDULE OF ESTIMATED PROGRESS PAYMENTS

A. Show estimated payment requests throughout Contract Times aggregating initial Contract Price.

B. Base estimated progress payments on initially acceptable progress schedule. Adjust to reflect subsequent adjustments in progress schedule and Contract Price as reflected by modifications to the Contract Documents.

1.05 APPLICATION FOR PAYMENT

A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of Contractor.

B. Use detailed Application for Payment Form suitable to the City and Engineer.

C. Provide separate form for each schedule as applicable.

D. Include accepted Schedule of Values for each schedule or portion of lump sum Work and the unit price breakdown for the Work to be paid on a unit priced basis.

E. Include separate line item for each Change Order and Work Change Directive executed prior to date of submission. Provide further breakdown of such as requested by Engineer.

F. Preparation:

1. Round values to nearest dollar.
2. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by Engineer.

G. No applications for payment will be reviewed or approved until all Action & Informational submittals have been submitted, reviewed by Owner, and approved.

1.06 PAYMENT

A. Payment for all Lump Sum Work shown or specified in Contract Documents is included in the Contract Price. Payment will be based on a percentage complete basis for each line item of the accepted Schedule of Values.

1.07 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
4. Material not unloaded from transporting vehicle.
5. Defective Work not accepted by Owner.
6. Material remaining on hand after completion of Work.

1.08 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

A. Partial Payment: No partial payments will be made for materials and equipment delivered or stored unless Shop Drawings and preliminary operation and maintenance data is acceptable to Engineer.

B. Final Payment: Will be made only for products incorporated in Work; remaining products, for which partial payments have been made, shall revert to Contractor unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

1.09 FORCE ACCOUNT

A. The City has estimated and included in the Proposal, dollar amounts for all items to be paid per force account, only to provide a common proposal for Bidders. All such dollar amounts are to become a part of Contractor's total bid. However, the Contracting Agency does not warrant expressly or by implication that the actual amount of work will correspond with those estimates. Payment will be made on the basis of the amount of work actually authorized by Engineer.

1.10 MOBILIZATION/DEMOBILIZATION

A. Mobilization shall include the obtaining of all permits; moving onto the site; furnishing and erecting temporary buildings, and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of the Work. Mobilization shall include the following principal items, but not limited to:

1. Moving on to the site of all Contractor's materials and equipment required for first month operations. Also, removing all materials, equipment, temporary utilities, office trailers, etc. from the site.
2. Installing temporary construction power, wiring, and lighting facilities.
3. Establishing fire protection system.
4. Providing construction water supply.

5. Providing field office trailer(s) for the Contractor and the Engineer, complete with all specified furnishings and utility services including telephones, telephone appurtenances, and copying machine.
6. Providing all on-site communication facilities, including telephones, and radio pagers.
7. Providing on-site sanitary facilities and potable water facilities.
8. Arranging for and erection of Contractor's work and storage yard.
9. Constructing and implementing security features and requirements.
10. Obtaining all required permits not obtained by the Owner.
11. Having all OSHA and WISHA required notices and establishment of safety programs.
12. Having the Contractor's superintendent at the job site full time.
13. Submitting submittals and material cut sheets and obtaining approvals.
14. Providing Preconstruction Photographs.
15. Project Closeout Items: The Contractor, prior to requesting final payment, shall obtain and submit the following items to the Engineer for transmittal to the Owner:
    a. Written guarantees, where required.
    b. Technical Manuals and instructions, including O&M Manuals.
    c. Maintenance stock items; spare parts; special tools.
    d. Completed record drawings.
    e. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
    f. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.11 BID ITEM MEASUREMENT AND PAYMENT DESCRIPTIONS

A. It is the intent of these Contract Documents that the performance of all work under the Bid Items will result in the complete construction of the Contract. Payment will be made only for items listed in the Bid Form in the Proposal. All other material, labor or equipment required for the work shall be considered as incidental to the construction.

B. The Contractor shall submit a breakdown of costs and a schedule of values for each lump sum Bid Item. The breakdown shall list the items included in the lump sum, together with a unit price for each item. The summation of the detailed unit prices for each item shall add up to the lump sum bid. The unit price values may be used as a guideline for determining partial payments or deductions for additional requested work changes.

C. The following construction activities and costs shall be considered incidental to the Bid Items of the contract and no separate measurement and payment will be made, but not limited to:

1. Loading, hauling, and properly disposing offsite of demolition, excavation, grading, and other discarded materials unless otherwise noted
2. Construction surveying
3. Developing and updating construction progress schedule
4. Site grading
5. Offsite disposal fees and disposal records, unless otherwise noted
6. Dewatering trenches and excavations (including, but not limited to, pumping equipment, generators, tanks, filters, discharge permits, and if required, water quality treatment and removal of sediment)
7. Saw cutting asphalt pavements, pipes, concrete, and structures
8. Locating existing buried utilities to determine precise location and depth, including potholing
9. Protecting existing utilities and power poles from damage or disturbance, including holding power poles and/or paying utility purveyor to hold power poles
10. Repair or replacement of utilities damaged by construction activities and/or financial reimbursement to affected utility purveyor
11. Furnishing, installing, maintaining, moving, and removing temporary steel trench plating
12. Furnishing, placing, maintaining, and removing cold mix asphalt
13. Dust control
14. Stockpiling and covering suitable native material for uses described in the Specifications and/or Drawings
15. Soil compaction testing and furnishing test reports
16. Moisture conditioning native soils for reuse on site, at optimum moisture content for compaction
17. Watering soils, plants, vegetation, hydroseed
18. Trimming and cleanup
19. Costs for compliance with permit conditions set forth in approved permits
20. Furnishing submittals and manufacturer’s certificates of compliance
21. Coordination and notifications with City staff and its agents, Engineer, governing agencies, property owners, and all other persons and entities participating in, or affected by, construction activities
22. Maintaining continual vehicular access to driveways and plant facilities
23. Furnishing, installing, inspecting, repairing, moving & removing temporary fencing and barricades for security and public safety

24. Any additional labor, materials, equipment and incidentals not specifically covered under a separate bid item.

D. The Measurement and Payment for the following Bid item descriptions apply to the corresponding Bid items as included in the Proposal:

Bid Item 1. Mobilization

Measurement and Payment: Lump Sum

The lump sum (LS) Contract Price for "Mobilization" shall constitute complete compensation for all of Contractor's preconstruction costs of preparatory work and operations including, but not limited to, those necessary for the movement of his personnel, equipment, supplies and incidentals to the Project; for the establishment of his offices, buildings and other facilities necessary for Work on this Project; for premiums on bonds and insurance for the Project, and for Work and operations that he must perform or costs he must incur before beginning production work on the various items on the Project. Mobilization also includes, but is not limited to, posting construction identification signs, securing permits, establishing safety and security measures, preparing a traffic control plan(s), preconstruction photographs, developing a Schedule of Values for lump sum bid items, submitting the project schedule and providing product and material submittals. Also include mobilization costs for all subcontracted work along with all costs for utility coordination noted on the Drawings and in the Specifications.

Items not included in this item include, but are not limited to:

Work covered by a specific bid item or Work that is to be included in a bid item or items.

Profit, interest on borrowed money, overhead or management costs.

Partial payments will be made for the lump sum contract price for "Mobilization" as follows:

When 5% of the total original contract amount is earned from other bid items, 50% of the amount bid for mobilization, or 5% of the total original contract amount, whichever is the least, will be paid.

When 10% of the total original contract amount is earned from other bid items. 100% of the amount bid for mobilization, or 10% of the total contract amount, whichever is the least, will be paid.

Upon completion of all work on the project, payment of any amount bid for mobilization in excess of 10% of the total original contract amount will be paid.

Bid Item 2. SPCC Plan

Measurement and Payment: Lump Sum

The lump sum (LS) Contract Price for "SPCC Plan" includes all costs associated with creating and updating the accepted SPCC (Spill Prevention, Control, and Countermeasures) Plan, and all costs associated with the setup of prevention measures and for implementing the Plan as specified in WSDOT Standard Specifications Section 1-07.15(1).

Bid Item 3. Temporary Erosion and Sediment Control

Measurement and Payment: Force Account

The Force Account (FA) Contract Price for "Temporary Erosion and Sediment Control" shall be in accordance with Section 00 72 00 and WSDOT Specification Section 1-09.6 and has been included for specific Temporary Erosion and Sediment Control (TESC) work items listed below and to address any additional and unanticipated work associated with TESC.

Temporary Erosion and Sediment Control work items shall include: all Work, labor, materials, tools and equipment necessary and incidental for the installation, maintenance and removal of the temporary erosion and sedimentation control (TESC) facilities to prevent pollution, erosion, siltation, and damage to any wetland, stream, other watercourse, or surrounding property throughout the life of the Contract. TESC facilities shall include, but not be limited to, any cover measures, runoff control measures, soil and site stabilization measures, filter fabric fencing, and inlet protection measures for the work area and downstream areas, per City Standard Plans 210 and 214.

The TESC measures shall limit the erosion possibility by covering disturbed soils, preventing sloughing or raveling of cut and natural slopes, and controlling surface runoff from flowing into excavations using measures such as curbs, berms, dikes, rock-lined ditches, and other approved measures. Filter fabric fence shall be used to treat small areas of non-concentrated runoff prior to discharge from the site.

The amount indicated in the proposal for this bid item is to provide a common bid amount. The actual amount paid under this item may vary from no payment to the full amount of the bid item. The Contractor will be required to initiate discussion for any work required per the plans and for work they believe is additional due to unanticipated circumstances and may be required to provide a cost estimate for the Engineer's review and approval prior to the work being performed. Approved work performed under this bid item will be performed only after a work directive is issued by the City/Engineer. Any additional work performed prior to the work directive issued by the City/Engineer will not be compensated under this bid item.

Bid Item 4. Trench Excavation Safety Systems

Measurement and Payment: Lump Sum

The lump sum (LS) Contract Price for "Trench Excavation Safety Systems" includes the costs of all the Work, labor, tools, materials, equipment and incidentals, required to select, construct, maintain, and remove trench safety systems for any and all excavations for which a safe environment is required, in compliance with Washington Industrial Safety and Health ACT (RCW 49.17) and safety and health standards such as Safety Standards for Construction Work (Chapter 296-155 WAC), General Safety and Health Standard (Chapter 296-24 WAC), General Occupational Health Standard (Chapter 296-22 WAC), and any other appropriate safety and health codes.

The lump sum bid item also includes design and engineering by a licensed professional engineer, as required, for shoring other than manufactured trench boxes.

Bid Item 5. Resolution of Utility Conflicts

Measurement and Payment: Force Account

The Force Account (FA) Contract Price for "Resolution of Utility Conflicts" shall be in accordance with Section 00 72 00 and WSDOT Specification Section 1-09.6 and has been included for specific miscellaneous work items listed below and for any additional work directed by the Engineer that is not required by the original Contract and to address any additional and unanticipated work associated with conflicts and construction circumstances determined by the Engineer not to be the responsibility or oversight of the Contractor.

This bid item does not cover conflicts already identified in the Plans that the Contractor is required to locate and pothole for confirmation. No payment will be made for conflicts from utilities that the Contractor has failed to have located or that have not been located sufficiently in advance to allow for changes in pipe alignment to avoid such conflicts.

The amount indicated in the proposal for this bid item is to provide a common bid amount. The actual amount paid under this item may vary from no payment to the full amount of the bid item. The Contractor will be required to initiate discussion for any work they believe is additional work due to unanticipated conflicts and may be required to provide a cost estimate for the Engineer's review and approval prior to the work being performed. Approved additional work performed under this bid item will be performed only after a work directive is issued by the City/Engineer. Any additional work performed prior to the work directive issued by the City/Engineer will not be compensated under this bid item.

Bid Item 6. Blower Building Structure

Measurement and Payment: Lump Sum

The lump sum (LS) bid price for "Blower Building Structure" shall constitute full compensation for all work, labor, materials, tools, equipment, and incidentals necessary to construct the blower building structure complete as shown on the Drawings and specified in the Project Specifications. The bid price shall include but not be limited to:

- Excavation of all materials of whatever nature encountered
- Excavation and grading to reshape and finish grade where shown on the Drawings and as required by field conditions
- Placing and compacting base material under the building
- Furnishing and installing 4-inch DI drain pipe from the building floor drain to the existing 8-inch DI drain north of the building. This includes all pipe, fittings, couplings, cutting of pipe, and excavation and backfill.
- Hauling and properly disposing of any excess material, including securing approved disposal site
- Placing, and mechanical compaction of import CSBC material under slab
- Maintenance and restoration of construction area and of other utilities affected by construction
- Grading and preparation of slab on grade and footing materials and equipment pads, formwork and reinforcement

- Installation of plumbing, water, drainage and process mechanical piping and appurtenances that involve slab penetrations or are to be buried beneath and within the confines of the building foundation
- Delivery, placing, finishing and quality control of concrete materials and any other items necessary to complete the Work in conformance with the Contract Documents
- Design, fabrication, and installation of a complete pre-engineered metal building, including insulation and overhead and single doors, with specified locking systems
- Adjustment and testing to verify satisfactory operational functions of the building structure, including access and weatherproofing; and any other items necessary to complete the Work in conformance with the Contract Documents.

The cost to haul and furnish CSBC material shall be included in Bid Item "Crushed Surfacing Top and Base Course."

Bid Item 7. Centrifugal Blower Installation

Measurement and Payment: Lump Sum

The lump sum (LS) Contract Price for "Centrifugal Blower Installation" shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental to install the City furnished new blower and to remove and relocate the existing blower from the existing building to the new blower building. Work shall include but not limited to, installation of the two blower skids with owner-furnished vibration pads onto equipment pads in accordance with manufacturer's recommendations and as shown on the Drawings and as described in the Specifications. Piping, valves, intake filter assemblies, and discharge silencer assemblies associated with these blowers shall be provided as part of Bid Item "Mechanical Piping, Valves, and Appurtenances".

Bid Item 8. Duplex Air Compressor Installation

Measurement and Payment: Lump Sum

The lump sum (LS) Contract Price for "Duplex Air Compressor Installation "shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental to install the City furnished duplex air compressor skid. Work shall include but not limited to, installation of the duplex air compressor skid in accordance with manufacturer's recommendations and as shown on the Drawings and as described in the Specifications. Piping, valves, and appurtenances associated with compressed air system shall be provided as part of Bid Item "Mechanical Piping, Valves, and Appurtenances".

Bid Item 9. Mechanical Piping, Valves, and Appurtenances

Measurement and Payment: Lump Sum

The lump sum (LS) bid price for "Mechanical Piping, Valves, and Appurtenances" shall constitute full compensation for all work, labor, materials, tools, equipment, and incidentals necessary to furnish and install or install owner-furnished equipment, including all mechanical piping, valves,

and appurtenances as shown on the Drawings and specified in the Specifications. The bid price shall include but not be limited to furnishing and installing or installing owner-furnished expansion joints, piping, spools, fittings, couplings, valves, gaskets, appurtenances, pressure gauges, intake filter assemblies, blower discharge silencers, connections to existing pipes, and pipe and equipment supports associated with the two centrifugal blowers and the duplex air compressor as shown on the Drawings and as described in the Specifications.

Bid Item 10. Building HVAC

Measurement and Payment: Lump Sum

The lump sum bid item for "Building HVAC" shall constitute full compensation for all labor, materials, tools, and equipment necessary and incidental to furnish and install HVAC work in the new blower building. Work shall include, but not be limited to HVAC permits and inspection fees, exhaust fans, louvers, grilles, supports, isolators, test and balance, all requirements as shown on the Drawings and as described in Division 23, HVAC.

Bid Item 11. Drain Piping

Measurement and Payment: Lump Sum

The lump sum (LS) bid price for "Drain Piping" shall constitute full compensation for all work, labor, materials, tools, equipment, and incidentals necessary to furnish and install all site drain piping, and appurtenances as shown on the Drawings and specified in the Specifications. The bid price shall include but not be limited to saw cutting existing pavement; excavation, removal, haul, and disposal of excavated native and waste material including existing pipes and structures in the excavation; furnishing and installing all piping, fittings, and appurtenances; connection to roof downspouts, building floor drain, and existing drain piping including fittings, spools and couplings; pipe zone bedding materials and placement, imported backfill materials and placement, hauling, and compaction associated with the site drain piping as shown on the Drawings and as described in the Specifications.

Bid Item 12. Crushed Surfacing Top and Base Course

Measurement and Payment: Ton

Measurement for crushed surfacing top and base course will be by the ton as recorded on certified weight tickets and limited to dimensions defined in the Work, descriptions for other bid items, shown on the Drawings, details or COE Standard Drawings or as otherwise approved by the Engineer. Crushed Surfacing Top and Base Course material placed exceeding "neatline" quantities without advance authorization by the Inspector will not be paid for.

The unit Contract Price per ton (TN) for "Crushed Surfacing Top and Base Course" shall be full compensation for all Work, labor, material, tools, and equipment necessary to furnish, haul, stockpile, place, grade, and compact imported crushed surfacing top and base course for the Work as required, from a Contractor supplied source.

The unit price for crushed surfacing top and base course also includes all costs for controlling moisture content.

Also included in this bid item shall be the cost of all Work required to compact native subgrade soils, as well as to uniformly spread and compact the crushed surfacing material.

Include in this bid item the cost of sprinkling during dry periods prior to placement of the crushed surfacing and while spreading and compacting the material.

Bid Item 13. Electrical and Controls

Measurement and Payment: Lump Sum

The lump sum bid item for "Electrical and Controls" shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental to furnish and install all Electrical and Controls work at the facility and shall include, but not be limited to, electrical permits and inspection fees, raceways, supports, conductors, grounding, trenching and backfill for electrical raceways, enclosed starters, disconnect switches, transformers, panelboards, variable frequency controllers, receptacles, lighting, lighting controls, access and security equipment, electrical connections for mechanical equipment, instrumentation and controls as shown on the Drawings and as described in Division 26 Electrical.

Bid Item 14. Startup and Testing

Measurement and Payment: Lump Sum

The lump sum bid item for "Startup and Testing" shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental for the startup and testing of all complete facilities, systems, and equipment as shown on the Drawings and specified in the Project Specifications. This shall include but not be limited to: blowers, air compressor, panelboards, control panel, SCADA, electrical power and controls, and HVAC systems. This pay item includes providing and paying all costs associated with on-site startup and inspection services from the blower manufacturer, including installation of the temperature and vibration sensors on the new and existing blowers. Also included under this pay item is providing up to three days of training to the City staff on all the equipment and systems mentioned in the previous sentence by qualified vendors and/or manufacturer representatives.

Bid Item 15. Final Restoration and Cleanup

Measurement and Payment: Lump Sum

The lump sum (LS) Contract price for "Final Restoration and Cleanup" shall be full compensation for reinstallation or replacement of all surface improvements disturbed by the construction process as necessary to achieve, as much as feasible, a condition equal to the pre-existing condition. The improvements which may be disturbed include, but are not limited to: mailboxes, fences, street signs, rockeries, grass, trees, shrubs, asphalt walkways, gravel driveways and paths, and rock landscaping. The lump sum price also includes performing trimming and cleanup per Section 2-11, as amended by the Special Provisions.

Prior to payment, the City reserves the right to compare the restoration with preconstruction pictures of said restored areas. Payment for furnishing gravel

for restoration of gravel driveways and paths will be made under the bid item "Crushed Surfacing Top and Base Course."

Bid Item 16. Minor Changes

Measurement and Payment: Force Account

The Force Account bid item Minor Changes has been included for specific miscellaneous work items listed below and for any additional work directed by the City or Engineer that is not required by the original Contract and to address changed conditions or unanticipated work. The amount indicated in the Proposal for this bid item is to provide a common bid amount. The actual amount paid under this bid item may vary from no payment to the full amount of the bid item. Work performed under this bid item will be initiated with a work directive issued by the Engineer.

In lieu of the preceding prescribed method of determining payment for Force Account work, payment may be made at unit prices or lump sum prices agreed to by the Engineer and the Contractor prior to beginning the Force Account work.

For the purpose of providing a common Proposal for all Bidders, and for that purpose only, the City has estimated an amount and included it in the bid item for Force Account work to become part of the total Bid by the Contractor.

Bid Item 17. Record Drawings

Measurement and Payment: Lump Sum

The lump sum (LS) Contract price for "Record Drawings" has been entered in the Proposal by the City and is to provide a common bid amount equal to 1% of the Engineer's Estimate for the project. This bid item shall be full compensation for providing the Engineer with final marked up drawings with deviations from the construction plans for the Work per the Special Provisions.

The record drawings shall be submitted to the Engineer no later than 14 calendar days after project acceptance.

Payment will be made for the lump sum contract price for "Record Drawings" as follows:

- 50% of lump sum price upon acceptance of preliminary record drawings
- 50% of lump sum price upon acceptance of final record drawings

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 22 20

SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 : GENERAL

1.01 SUMMARY

A. Changes to the Work may be required due to field conditions, requests made by the City, clarifications to the bid documents, or other needs that result in a change in the cost of the work and/or change in the number of contract days per Section 00 72 00-6. The changes to the work will be tracked individually as Request for Change Proposals (RFCP). Request for Change Proposals may either be prepared as a Field Directive, or as a request for pricing prior to proceeding with the work.

B. A change order will be issued for one or more RFCPs grouped into a single change order. Payment for changed work cannot be paid until the change order is finalized and approved as outlined per Section 00 72 00-6.

C. The Request for Change Proposal shall clearly identify all labor, material, equipment, incidentals, including subcontractor's and supplier's invoices or quotes and Contractor's timecards. A reference from the latest approved schedule shall be attached justifying any time extension request. Mark ups for all overhead, profit, bond cost, B & O taxes, and insurance shall be added per Section 00 72 00 - General Conditions.

D. Contractor, and Subcontractors where required, shall provide a breakdown of labor costs including basic wage rates, fringe benefits, FICA, FUTA, and SUCA add-ons, per Section 00 72 00-9.6. Where premium time is involved, the Contractor shall provide a breakdown of costs in the same detail.

1.02 FIELD DIRECTIVE MODIFICATION PROPOSALS

A. Changed conditions and/or unanticipated circumstances may require immediate revisions to Work which are essential and from which a delay would result in a time and or cost penalty to the project. When such a condition exists, the City may issue a written Field Directive to the Contractor.

B. The City will provide direction for the Contractor identifying the necessary changes to be made. The Field Directive shall be identified with a Request for Change number. The Contractor will provide pricing per 1.01.C. of this Section within 15 calendar days of the completion of the Work.

1.03 LUMP SUM MODIFICATION PROPOSALS

A. The City may request priced proposals which either add or delete work prior to proceeding with any changes.

B. When requested, the Contractor shall provide pricing per 1.01.C. of this Section for review and approval by the City, prior to proceeding with the work.

1.04 CHANGE ORDERS

A. A change order to the Work will be issued including one or more Request for Change Proposals. The cumulative amount of adds and deducts along with the change in the number of days approved in each individual RFCP shall be added to or deducted from the Contract. The change order shall incorporate the RFCP forms, and all required back up documentation into a lump sum contract adjustment.

B. The payment for work performed under the change order cannot be made until the change order has been signed and approved as per Section 00 72 00-6.

C. If an individual change order exceeds 10% of the original contract amount and is over $50,000, a special review may be required by the City.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 26 00

SECTION 01 26 02
RFI TEMPLATE

REQUEST FOR INFORMATION

To Project Manager:

From Contractor:
Signature:

Document Reference:
(Drawing Sheet, Detail No. / Spec. Section)

☐ Architectural ☐ Civil ☐ Structural ☐ Mechanical ☐ Electrical ☐ Other _____

Request

Request / Recommended Solution:

☐ Attachments

Date Required For Response: _____ Initiated By: _____
(Name) (Firm)

Response

Engineers Response:

☐ Attachments

Response By: Firm: Date:

NOTE: This is not an authorization to proceed with work involving additional cost and/or time. Notification must be given in accordance with the Contract Documents if any response causes any change to the Contract Sum and/or Contract Time.

Copies: ☐ Owner's Representative ☐ Consultant _____
☐ Other_____ ☐ File

END OF SECTION 01 26 02

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 : GENERAL

1.01 PRIOR TO APPLICATION OF PROGRESS PAYMENTS

A. Submit and receive approval of construction progress schedule and schedule of values as specified in Section 01 32 16 - Construction Progress Schedule.

B. Submit a list of all Subcontractors and Suppliers performing work.

1.02 PAYMENT REQUESTS

A. General: Except as otherwise indicated, the progress payment cycle is to be regular. Each application must be consistent with previous applications and payments. Certain applications for payment, such as the initial application, the application at Substantial Completion, and the Final Payment Application involve additional requirements.

B. Payment Application Times: The cut-off date for each application for a progress payment shall be per the City's current schedule. The Schedule will be presented to the Contractor at the pre-construction meeting. Applications received after the set scheduled date of each month, will be processed the following month. Work should not be projected past the cut-off date.

C. Payment Application Forms: Application for payment shall include the Contractors' official letterhead, invoice number, date of invoice and project identification.

D. Application Preparation: Except as otherwise indicated, complete every entry provided for on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by the Project Manager without action. Entries must match current data of schedule of values and progress schedule and report. List change orders approved prior to submission date individually using the City's Change Order designation and description, as if for an original component item of work at the end of the form. Do not bill for contract change proposals until an approved Change Order has been received incorporating the change.

1.03 SUBMITTAL PROCEDURE

A. Contractor is cautioned to carefully check all extensions, totals, and required information for accuracy before formal submittal.

B. Submit three (3) copies of application for payment.

C. Applications are to be signed by a responsible officer of the Contractor. Sign copies in blue ink: photocopies of signature will not be accepted.

D. Application for payment shall include the following:

1. Approved form for Application for Payment.
2. Affidavit stating that all Subcontractors and materialmen have been paid for work previously billed (do not submit with the first billing).

E. When the Project Manager finds application properly completed and correct, he/she will sign and transmit all copies of application for Payment for processing.

F. If the Project Manager finds an application improperly or incorrectly executed, an annotated copy will be returned for New Submittal.

G. Only minor corrections are allowed on forms with approval of the Project Manager.

1.04 PROGRESS PAYMENTS AND PAYMENTS WITHHELD

A. City shall make progress payments as stipulated in the General Conditions, Section 00 72 00-9.

1.05 FINAL PAYMENT

A. No application for final payment will be accepted for processing until satisfactory completion of the following:

1. Contractor's Certificate of Payment of Debts & Claims.
2. Contractor's Certificate of Release of Liens.
3. Punchlist items complete and accepted.
4. Contract closeout document submittals received and accepted.
5. Final Change Orders signed off.
6. Affidavit of wages paid for general and all subcontractors and materialmen.
7. Subcontractor releases.
8. Required permits signed off.
9. Other requirements as specified in Section 01 77 00 - Closeout Procedures.

B. Provided that the Contractor has completed or fulfilled all of its obligations under the contract, the City shall make final payment as provided in the General Conditions, Section 00 72 00-9.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 29 00

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 : GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for processing and submitting Schedule of Values.

1.02 SCHEDULE OF VALUES SUBMITTAL PROCEDURES

A. Submit a Schedule of Values for review by the City within 14 calendar days after Notice to Proceed and no less than 30 calendar days prior to submittal of first Application for Payment.

B. Submit updated Schedule of Values with each subsequent Application for Payment.

C. Submit revised Schedule of Values reflecting City accepted Change Orders and other Modifications to the Contract that affect Contract Sum or Contract Time.

D. The City reserves the right to reject Schedule of Values submittals that appear front loaded or do not reasonably approximate anticipated cost of identified line items.

1.03 FORMAT

A. Forms: AIA Form G703 - Application and Certificate for Payment Continuation Sheet, electronic media facsimile, or other forms as accepted by the City.

B. Format Size: 8-1/2 inch by 11 inch or 11 inch by 17 inch.

1.04 GENERAL REQUIREMENTS

A. Maintain Schedule of Values as basis for supporting Application for Payment amounts requested for each progress payment.

B. Correlate corresponding items listed by Schedule of Values line items with other required administrative schedules and forms, including:

1. Contractor's Construction Progress Schedule.
2. Application for Payment forms, including Continuation Sheets. Correlate Schedule of Values line items to that listed by Application for Payment:
    a. Correspond to indirect costs and margins on actual cost.
    b. Make amounts for total coast and overhead and profit complete and proportionate.
    c. Include overhead and profit as a single line item.
3. List of subcontractors.

4. List of principal suppliers and fabricators.
5. Schedule of submittals and list of products.

C. Use as basis for determining dollar value amount for each work activity and component of work for duration of Project.

D. Make Schedule of Values total sum equal to current Contract sum.

E. Round-off figures to nearest dollar amount.

F. Identify Schedule of Value line items by corresponding Section Titles in Project Manual Table of Contents.

G. Break down major portion of work by areas, disciplines, phase, systems, or as appropriate for ease of review.

H. For work that exceeds 1.0 percent of Contract Sum, break out separate line items according to major work activities, components, products, or operations.

1.05 CONTENT

A. Identification: Include the following Project identification on the Schedule of Values:

1. Project name and location.
2. City's name.
3. Project number.
4. Contractor's name and address.
5. Date of original submittal.
6. Date of revised submittals.

B. Work Activities: Indicate Cost Values for labor, material, equipment, and Contractor's overhead and profit, and Total Cost Value for each line item.

1. Distribute Contractor’s office overhead and profit proportionally among allocated cost for each work activity.
2. Costs associated with ongoing mobilization activities can be listed separately or distributed evenly among allocated cost for each work activity.
3. Assign overhead costs corresponding to start and finish dates for each work-related activity.
4. Pro-rate associated work expenses related to work activities, including supervision, temporary utilities, and small tools, over total Contract Time.
5. Assign directly related costs, including bonds, insurance, and schedules, to appropriate work activities.
6. Claims for additional cost for storage of materials off-site are not accepted as a basis for monetary claims, except where need for off-site storage arose after the Bid and at request of the City.

C. Overhead and Administrative Costs: Distribute major cost items which are not a direct cost of actual work-in-place as line item in Schedule of Values, or distributed as general overhead expense.

1. Conditions of the Contract for Mobilization and Demobilization: The lump sum price for Mobilization and Demobilization shall be full compensation for Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplies and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices, phone service, safety equipment and first aid supplies, field surveys, sanitation needs and all other facilities required by these specifications, and State and local laws and regulations. The costs of bonds, permits, and any required insurance, and any other preconstruction expense necessary for the start of the Work shall also be included. This Work also consists of the general project management of the Work including, but not limited to, field supervision and office management, as well as other incidental cost for management of the Work during the duration of the Contract. This lump sum shall not exceed 5% of the total of all bid items.
2. When 5% of the original Contract amount is earned from other bid items, 50% of the amount bid for Mobilization and Demobilization, or 5% of the original Contract amount, whichever is lesser, will be paid.
3. Upon completion of work for the project, payment of the remaining amount bid for Mobilization and Demobilization will be paid.

1.06 LINE ITEM CATEGORIES

A. Arrange Schedule of Values in tabular form with separate columns. Break out the following for each work activity listing:

1. Section Number from Project Specifications Table of Contents.
2. Description of Work.
3. Name of subcontractor.
4. Scheduled Value for each Item of Work.
5. Pervious Work Complete, including Cost Value and Percent Complete.
6. Present Work Complete, including Cost Value and Percent Complete.
7. Change Orders (numbers) that affect value.
8. Total Billing, including Billing to Date, Percent of Contract Sum, and Balance to Finish. Show dollar value as percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
9. Retainage.
10. Stored Material.

1.07 COST CATEGORIES

A. Assign the following, making sum equal to total cost for each line item activity to show initial costs of work activity and total installed cost.

1. Labor.
2. Equipment.
3. Material.
4. Subcontractor.
5. Overhead and Profit.
6. Total Cost.

B. Show total sum for each cost category as well as total cost for each work activity.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 29 73

SECTION 01 31 19
PROJECT MEETINGS

PART 1 : GENERAL

1.01 PRECONSTRUCTION MEETING

A. After award of the Contract, the Project Manager will schedule a pre-construction conference at a date and time mutually agreeable to all concerned parties. The Project Manager will conduct the conference, record minutes, and issue copies thereof to all in attendance.

B. Attendance by the Contractor's project manager, job superintendent and all Subcontractors is required. Suppliers, and other parties interested in the performance of the Work may also attend.

C. The purpose of the conference is to introduce all primary parties involved in the construction of the Project and to review procedures to be followed during construction. Discussion will follow detailed Project Manual requirements including, but not limited to:

1. Project Administration:
    a. Names, telephone numbers and email addresses of the following:
        1) City.
        2) Contractor.
    b. Names of project managers, superintendents, and foremen and accompanying telephone and email addresses for the following:
        1) Contractor.
        2) Contractor's major Subcontractors.
2. Communications:
    a. Channel of communications.
    b. Instructions to Contractor.
    c. Oral conversations and requirements for written backup.
    d. Appropriate Contractor-City communication.
    e. Requests for information from Contractor to the City.
3. Submittal Data:
    a. List of Subcontractors and Suppliers.
    b. Submittals.
    c. Samples.
    d. Progress Schedule.
4. Change Orders:
    a. Origination.

b. Required cost breakdown.

c. Inclusion in monthly pay application.

d. Time extension.

5. Payments:

a. Schedule of Values.

b. Progress payment review at Project Site.

c. Monthly progress payment cut-off date.

6. Site Visits.

7. Record Documents.

8. Finish and Coordination.

9. Notice to Proceed.

10. Other Topics as Appropriate to Project.

1.02 PROGRESS MEETINGS

A. Meeting Location: Contractor's project field office, unless otherwise agreed.

B. Attendance shall include City, Contractor, Project Superintendent, and others as appropriate to agenda for each meeting.

C. The Contractor shall:

1. Prepare agenda and administer progress meetings, and specially called meetings throughout work progress.

2. Preside at meetings.

3. Record minutes; include all significant proceedings and decisions.

4. Reproduce and distribute copies of minutes within three (3) days of each meeting to all meeting participants.

5. Ascertain that work is prosecuted consistently with contract documents and construction schedules.

D. Suggested Agenda:

1. Review and approve minutes of previous meeting.

2. Review work progress since previous meeting.

3. Review plans for progress for succeeding work period.

4. Review construction schedule.

5. Present corrective measures and procedures to regain project schedule, as applicable.

6. Present field observations, problems, and conflicts.

7. Discuss problems impeding progress schedule.

8. Review Quantity Control.

9. Coordinate work.
10. Review proposed changes for:
    a. Effect on construction schedule and on completion date.
    b. Effect on any other contracts of the project.
11. Review draft of application for payment (at end of month).
12. Review required revisions to project record documents.
13. Review project safety.
14. Review any other business.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 31 19

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SECTION 01 32 11
CONSTRUCTION CONSTRAINTS AND SEQUENCE

PART 1 : GENERAL

1.01 SEQUENCE

A. This Section describes the constraints during construction, and the guidelines for construction sequencing that the Contractor shall incorporate into the performance of the contract.

1.02 SUBMITTALS

A. Construction Progress Schedule: Prepare the Contractor's Construction Progress Schedule as defined in Section 01 32 16, based on the constraints and sequence defined herein.

1.03 COORDINATION AND SCHEDULING

A. Prior to starting the work, confer with the City to develop a work schedule which will permit adjacent utilities and rights-of-way to function normally. Do not make connections between existing facilities and new work until necessary inspection and tests have been completed on the new work and it is found to conform in all respects to the requirements of the Contract Documents.

B. Connection to existing services or utilities, or other work that requires temporary shutdown of any existing operations or utilities shall be planned in detail with appropriate scheduling of the work and coordinated with the City or other impacted utilities. The approved schedule for shutdown or restart shall be indicated on the Contractor's Progress Schedule, and advance notice shall be given in order that the City may witness the shutdown, tie-in, and startup.

1.04 CONSTRUCTION SEQUENCING

A. The construction sequence is provided on Drawing G 2. The construction sequence is provided for Contractor reference only and does not imply direction, means, or methods of construction. The Contractor shall be responsible for completing all elements of work as described in the Contract Documents.

1.05 LONG LEAD ITEMS

A. The project will require the Contractor to procure a pre-engineered metal building, and electrical and mechanical equipment, which may be subject to long lead times. The Contractor shall notify the City/Engineer promptly of any equipment or materials with long lead times which prevent the Contractor from completing the project within the Contract Time. Any suspension of Work shall be in accordance with Section 5.3 Suspension Procedures of Specification Section 00 72 00, General Conditions. Any extension of Contract Time shall be in accordance with Section 5.2.2.2 Extensions of Contract Time of Specification Section 00 72 00, General Conditions.

1.06 WORK CONSTRAINTS

A. The following is a list of work constraints by which the Contractor shall comply with during construction of the new facilities:

1. Provide temporary erosion, sedimentation, and dust control for containment of materials within the construction sites.
2. All work shall comply with applicable permits obtained for the project, including hours of operation and noise restrictions.
3. Providing vehicle and personal access to all on-site existing facilities.

B. The Contractor shall schedule and conduct his/her work in a manner consistent with achieving these purposes and shall comply with the specific limitations hereinafter specified.

C. Air Scour System Shutdown Limitations:

1. April 15th – September 15th (high demand season):
   a. 4 hours maximum downtime in a single 24-hour period.
2. September 16th – April 14th (low demand season):
   a. 8 hours maximum downtime in a single 24-hour period.

D. Compressed Air System Shutdown Limitations:

1. Maximum 1 hour to depressurize the system, make the connection, test the system, and restore the system.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 32 11

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 : GENERAL

1.01 CONSTRUCTION SCHEDULE

A. The Contractor shall prepare a construction schedule showing all tasks required to perform the work. Schedule shall show all tasks performed by all trades that is required to perform work within the contract time. The Schedule shall include sufficient time for cleaning, punch list review, and completion of punch list items prior to the designated physical completion date.

1.02 FORMAT

A. The Schedule shall be a critical path method Gantt chart style and follow the Type B Progress Schedule in WSDOT Standard Specification Section 1-08.3(2)B.

B. The Schedule shall clearly identify all work and detailed to show specific steps to perform work. The relationship between the work items shall show the starting date, length of time required to perform work, completion of the work within the time frame shown.

C. All work found on the schedule of values shall be clearly identified. Unless otherwise expressly authorized in writing by the City's representative, the Contractor must integrate the schedules with the Schedule of Values and unit price items so that each construction activity is represented by a dollar value.

D. Submittal dates shall be included and the relationship between submittal and the work item shall be identified.

E. Materials requiring long lead times shall be clearly identified on the schedule. This shall include:

1. Date materials musts be ordered.
2. Time for manufacturing.
3. Time for delivery.
4. Delivery date (expected date materials to be at the project).
5. Date of Installation.

1.03 SUBMITTAL

A. At the pre-construction meeting, a preliminary schedule is required to be submitted. Once the preliminary schedule has been approved, the schedule shall become the Project Schedule. The Project Schedule, as approved by the City, will be an integral part of the contract and will establish interim completion dates for the various activities under the contract.

B. Schedule shall be submitted electronically. Acceptable formats are .xls and pdf.

C. Review by the City or City's Representative shall not constitute approval or acceptance of the Contractor's construction means, methods, sequencing, logic, order, precedence and succession of activities or Contractor's ability to complete the Work in a timely manner.

D. The review/approval of any schedule shall not transfer any of the Contractor's responsibilities to the City.

E. Subcontractors shall review all schedules prior to submittal. At the City's option and sole discretion, the City may require the Contractor to obtain written acceptance of each schedule by subcontractors as practical and feasible, as the schedule relates to subcontractors' work.

1.04 UPDATES

A. A 3-week look ahead schedule shall be provided prior to each progress meeting. At each progress meeting the 3-week look ahead and the Project Construction Schedule will be reviewed and updated as necessary. All changes to the Project Construction Schedule of more than three (3) working days shall be documented. The Schedule shall be updated to show measures required to bring project back on schedule. The Contractor alone shall remain responsible for adjusting forces, equipment, and work schedules to ensure completion of the work within the Contract Time. Any mistakes or errors in any schedule, including, but not limited to, mistakes or errors of logic, order, precedence, and duration, are and remain the Contractor's.

B. Should any activity not be completed by the stated scheduled date, the City will have the right to require the Contractor to expedite completion of the activity by whatever means appropriate and necessary, without additional compensation to the Contractor.

C. The Schedule shall be used to justify time extension days requested by the Contractor. For additional days requested, the Schedule shall be detailed enough to identify the work item(s) affected and the relationship to the changed or added work.

D. Schedule shall be provided during the construction meetings. Schedule shall be on 11x17 papers and shall show current work progress.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 32 16

SECTION 01 33 00
SUBMITTALS

PART 1 : GENERAL

1.01 SUMMARY

A. Wherever submittals are required hereunder, all such submittals by the Contractor shall be submitted to the City.

B. Within 10 business days, unless otherwise noted, after the Owner's Notice to Proceed (NTP) to Contractor, the Contractor shall submit the following items to the City for review:

1. A draft Construction Schedule; Schedule of Values and a preliminary schedule of Shop Drawings, Samples, and proposed Substitute ("Or-Equal") submittals.
2. A list of all permits and licenses the Contractor will obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.
3. Submittal of Temporary Erosion and Sediment Control (TESC) Plan.
4. Contractor's designated Emergency Contact personnel, other Contact Persons and corresponding telephone and pager numbers.
5. Submittal of Spill Prevention, Control, and Countermeasure (SPCC) Plan prior to mobilization.
6. Submittal of Stormwater Pollution Prevention Plan (SWPPP) prior to construction.
7. Submittal of Health and Safety Plan, prior to mobilization.

1.02 SHOP DRAWINGS

A. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, list, graphs, catalog sheets, data sheets, and similar items. Whenever the Contractor is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of a City registered in the appropriate branch in Washington state, unless otherwise directed or required herein.

Electronic submittals of shop drawings or other documents required for approval may be substituted for paper copies. Electronic submittals must be submitted utilizing current portable document format (PDF) software. All electronic submittals shall be certified documents and digitally signed showing Contractor's review, and stamp showing approval of submittal. All electronic submittals shall be book-marked. A table of contents is required and shall be placed directly behind the cover page. Document properties shall include the Job Name, Division (Section Number), and items included in the submittal. Prior to use of electronic submittals, discuss with the City, procedures and formatting including any additional contents to be included within the document.

B. All Shop Drawing submittals shall be accompanied by standard submittal transmittal form provided by the Contractor and approved by the City. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for resubmittal.

C. Consecutively number all submittals. Accompany each submittal with a letter of transmittal showing the transmittal number, date of transmittal, specifications section or drawing number to which the submittal pertains, brief description of the material submitted, and the company name of the originator of the submittal.

Resubmittals shall be numbered with the same number as the original submittal followed by a sub nomenclature such as -A, -B, -C, or .01, .02, .03, for example:

Original Submittal – 01 5000

Resubmittal 1 – 01 5000.01

Resubmittal 2 – 01 5000.02, etc.

Maintain an accurate submittal log for the duration of the construction period, showing status of all submittals. Make the log available to the City upon request.

D. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items, taken together, constitute a manufacturer's "package" or are so logically or functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the City.

E. For most submittals, the City will return prints of each submittal to the Contractor with its comments noted thereon, within 14 calendar days after their receipt at the City’s offices. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the City by the second submission of a submittal item. The Owner reserves the right to withhold monies due to the Contractor to cover additional costs of the City's review beyond the second submittal.

F. If a submittal is returned to the Contractor marked "NO EXCEPTIONS TAKEN,", or “REVIEWED FOR INFORMATION ONLY” formal revision and resubmission of said submittal will not be required.

G. If a submittal is returned to the Contractor marked "MAKE CORRECTIONS NOTED," formal revision and resubmission of said submittal will not be required.

H. If a submittal is returned to the Contractor marked "AMEND-RESUBMIT," the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the City.

I. If a submittal is returned to the Contractor marked "REJECTED-RESUBMIT," the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the City.

J. Fabrication of an item shall be commenced only after the City has reviewed the pertinent submittals and returned copies to the Contractor marked either “NO EXCEPTIONS TAKEN”, “REVIEWED FOR INFORMATION ONLY” or “MAKE CORRECTIONS NOTED.” Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.

K. All Contractor shop drawing submittals shall be carefully reviewed by an authorized representative of the Contractor, prior to submission to the City. Each submittal shall be dated, signed, and certified by the Contractor, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the City of any Contractor submittals will be made for any items which have not been so certified by the Contractor. All non-certified submittals will be returned to the Contractor without action taken by the City, and any delays caused thereby shall be the total responsibility of the Contractor.

L. The City's review of Contractor shop drawings submittals shall not relieve the Contractor of the entire responsibility for the correctness of details and dimensions. The Contractor shall assume all responsibility and risk for any misfits due to any errors in Contractor submittals. The Contractor shall be responsible for the dimensions and the design of adequate connections and details.

M. The Contractor’s Submittals and Shop Drawings shall not be used to submit substitutions of materials or methods required by the Contract. Instead, all requests for substitutions shall be made as a separate request.

N. This review is only for general conformance with the design concept of the project and the information given in the Contract Documents. Corrections or comments made on the project data submittals and shop drawings during this review do not relieve the Contractor from his/her obligation to perform fully all contract requirements. Contractor is not entitled to rely upon the corrections or comments made on the project data submittals and shop drawings during this review. The review by the Engineer of project data and shop drawings is only for conformance with the general design concept of the project, and does not extend to consideration of specific dimensions, structural integrity, safety, detailed installation and construction requirements, or any other obligation of the Contractor. Review of a specific item shall not include review of an assembly of which the item is a component. The review by the Engineer is for the benefit of the Owner only. Any action shown is subject to the requirements of the Contract Documents. Neither the review of the Contractor’s submittal nor the corrections or comments provided herein, shall create any duty owed to or a cause of action in favor of the Contractor or any Subcontractor. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; information that pertains solely to the fabrication processes or to means, methods, techniques sequences and procedures of construction, coordination of the Work with that of all other trades and performing all Work in a safe and satisfactory manner.

1.03 CONTRACTOR'S SCHEDULE

A. The Contractor's construction schedules shall be prepared and submitted to the City.

1.04 SAMPLES

A. Whenever samples are required by the Specifications, the Contractor shall submit not less than 3 samples of each item or material to the City for acceptance at no additional cost to the Owner.

B. Samples, as required herein, shall be submitted for acceptance a minimum of 10 working days prior to ordering such material for delivery to the jobsite, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the work.

C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Manufacturer's name for identification and submitted to the City for acceptance. Upon receiving acceptance of the City, one set of the samples will be stamped and dated by the City and returned to the Contractor, and one set of samples will be retained by the City, and one set of samples shall remain at the job site until completion of the Work.

1.05 OWNER'S MANUALS (TECHNICAL MANUALS)

A. The Contractor shall submit technical operation and maintenance information for each item of mechanical, electrical and instrumentation equipment they furnish (Owner furnished equipment not included), in an organized manner in the Owner's manual. It shall be written so that it can be used and understood by the Owner's operation and maintenance staff.

B. The Owner's manual shall be subdivided first by specification section number; second, by equipment item; and last, by "Part." Specification section subdivisions shall be separated using pre-printed dividers, and types of equipment within each section shall be separated using a goldenrod-colored sheet bearing the equipment name. "Parts" shall conform to the following (as applicable):

1. Part 1 - Equipment Summary:
    a. Summary: A summary table shall indicate the equipment name, equipment number, and process area in which the equipment is installed.
    b. Form: The City will supply an Equipment Summary Form for each item of mechanical, electrical and instrumentation equipment in the work. The Contractor shall fill in the relevant information on the form and include it in Part 1.
2. Part 2 - Operational Procedures:
    a. Procedures: Manufacturer-recommended procedures on the following shall be included in Part 2:
        1) Installation

2) Adjustment

3) Startup

4) Location of controls, special tools, equipment required, or related instrumentation needed for operation

5) Operation procedures

6) Load changes

7) Calibration

8) Shutdown

9) Troubleshooting

10) Disassembly

11) Reassembly

12) Realignment

13) Testing to determine performance efficiency

14) Tabulation of proper settings for all pressure relief valves, low and high pressure switches, and other protection devices

15) List of all electrical relay settings including alarm and contact settings

3. Part 3 - Preventive Maintenance Procedures:

   a. Procedures: Preventive maintenance procedures shall include all manufacturer-recommended procedures to be performed on a periodic basis, both by removing and replacing the equipment or component, and by leaving the equipment in place.

   b. Schedules: Recommended frequency of preventive maintenance procedures shall be included. Lubrication schedules, including lubricant SAE grade, type, and temperature ranges, shall be covered.

4. Part 4 - Parts List:

   a. Parts List: A legible and original, un-faxed, complete parts list shall be furnished, including a generic description and manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included.

   b. Drawings: Cross-sectional or exploded view drawings shall accompany the parts list.

5. Part 5 - Wiring Diagrams:

   a. Diagrams: Part 5 shall include complete internal and connection wiring diagrams for electrical equipment items.

6. Part 6 - Shop Drawings:

   a. Drawings: This part shall include approved shop or fabrication drawings, complete with dimensions.

7. Part 7 - Safety:

    a. Procedures: This part describes the safety precautions to be taken when operating and maintaining the equipment or working near it.

8. Part 8 - Documentation:

    a. All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.

C. The Contractor shall furnish to the City 4 identical Owner's manuals. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring, loose-leaf, vinyl plastic hard cover, locking, “Slant-D” style binder with clear vinyl spine and front pockets suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents indicating all equipment in the manuals shall be prepared.

D. Owner's manuals shall be submitted in final form to the City not later than at the date that 90 percent of construction substantial completion is attained. All discrepancies found by the City in the technical manuals shall be corrected by the Contractor within 30 days from the date of written notification by the City.

1.06 SPARE PARTS LIST

A. The Contractor shall furnish to the City 4 identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts which each manufacturer recommends be maintained by the Owner in inventory. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the Owner in ordering. The Contractor shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents. The spare parts lists shall be bound in standard size, 3-ring, loose-leaf, “Slant-D” style, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

1.07 FIELD RECORD DRAWINGS

A. Between the date that Notice To Proceed becomes effective and the date that the Owner accepts the entire work, the Contractor shall maintain one legible, neatly marked set of full-size Field Record Drawings showing: Any and all changes from the original Contract Drawings in location, elevation, or configuration of all facilities, pipelines, valves, fittings, manholes, vaults, catch basins, inlets, roads, site work and other pertinent items, whether existing or new.

B. The Field Record Drawings shall be kept in the Contractor's site office and shall be available for review by the City at all times. The Field Record Drawings shall be maintained by the Contractor to reflect the current state of the work at all times. The Field Record Drawings shall be updated at least daily, and any changes occurring on one day shall be entered on the Field Record Drawings by noon on the next working day. The Contractor and City shall review the record drawings together at least weekly, during regular site meetings. The Contractor's pay estimates or other pay requests shall not be considered complete or payable unless the Field Record Drawings are current as required by this Section.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 33 00

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SECTION 01 35 29
HEALTH AND SAFETY

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers the requirements for compliance with health and safety precautions and controls for projects without hazardous waste operations.

B. Safety plan.

C. Protection of equipment, public and City staff.

1.02 REFERENCES

A. General: The publications listed below form a part of these specifications to the extent referenced. The publications are referred to in the text by basic designations only.

B. Code of Federal and State Regulations:

1. OSHA General Industry Safety and Health Standards (29 CFR 1910), Publication V2206; OSHA Construction Industry Standards (29 CFR 1926).
2. National Emission Standards for Hazardous Air Pollutants (40 CFR, part 61).
3. Washington State Department of Labor and Industries (WISHA) 49.17-49.26 RCW.
4. Washington Administration Code (WAC) 296-155 Safety Standards for Construction Work.

1.03 SUBMITTALS

A. The Contractor shall submit the following submittals.

1. Health and Safety Plan (specific to this project):
   a. This plan shall be delivered within 5 days after Notice to Proceed has been received.
   b. The plan will be reviewed for completeness.
2. Copies of all minutes/notes from daily safety meetings.

1.04 HEALTH AND SAFETY PLAN

A. The Contractor shall develop a Site Specific Health and Safety Plan (Safety Plan) addressing health and safety management methods specific to the project. The Safety Plan shall, at a minimum, include:

1. The name of the individual at the jobsite responsible for implementation and compliance with this Safety Plan.

2. If work requires the use of Fall Restraint or Fall Arrest, a Fall Protection work plan meeting the requirements set forth in WAC 296-155 shall be included.
3. If applicable, the Safety Plan shall include the name and qualifications of any electrical safety observer to be provided by the Contractor.
4. Steps taken to provide Protection of the Public and City Employees. This includes protection from falling objects. Indicated type of overhead safeguards and protection to be installed and safeguards from equipment damage due to debris (including nails) on the ground.
5. A description of tasks to be undertaken, and equipment mobilized for this project.
6. A list of all known and expected safety or health hazards, problems, and proposed control mechanisms.
7. Safety Data Sheets (SDS) of and procedures for using, disposing of, or storing for all chemicals, products, or materials regulated by WAC 296-62 to be used by the Contractor.
8. A list of personal protective equipment, monitoring devices, and hazard-specific plans or permits as appropriate and required by State and Federal regulations.
9. A description of emergency response measures, equipment available for emergency response to address accidents and releases of materials, including, but not limited to, first aid, eye wash/showers, and fire extinguishing equipment, and location of this equipment at the jobsite.
10. Emergency phone numbers contacts, and location of the nearest medical facility.
11. A monitoring and inspection plan and record keeping measures to ensure that equipment and work practices comply with this Safety Plan.
12. Personnel names, training, and notification procedures as appropriate to ensure that all jobsite personnel are familiar with the Safety Plan elements. Include copies of training certificates.
13. Procedures for safe storage and handling of flammable liquids, in accordance with WAC 296-24-330.
14. If applicable the Contractor shall include procedures for safe storage and handling of compressed gasses in accordance with WAC 296-24-295, Compressed Gas General Requirement.
15. Other issues which the Contractor determines are appropriate and necessary to protect worker safety and health.
16. This Safety Plan shall be posted and marked in a location on site that will be noticed upon entry of work site. A fall protection plan must also be established and shall be posted next to the Safety Plan (Accident Prevention Program). These postings are required to be protected from inclement weather and must be legible during the extent of this contract.

1.05 HEALTH AND SAFETY REPRESENTATIVE

A. The Contractor shall designate a Health and Safety Representative who will oversee all work taken place on the job site including work performed by subcontractors and suppliers. The Health and Safety Representative should be capable of identifying hazards within the job site, take immediate actions to correct hazard and if needed, stop work until hazards have been corrected.

B. The Contractor shall authorize the Health and Safety Representative to resolve safety-related issues raised by the City.

C. The Health and Safety Representative is responsible to ensure that work is performed in accordance with the Safety Plan.

D. At the daily job briefing and/or tailgate conference, Contractor shall provide the City's representative in attendance at the meeting all relevant information on the Work to be performed, its location, and the equipment to be used.

E. The Contractor is responsible to ensure that its workers and subcontractors have all safety equipment required for the Work.

F. Nothing in this Contract shall be construed as imposing any duty upon the City or any of its employees with regard to, or as constituting any express or implied assumption of control or responsibility over, Project Site safety, or over any other safety conditions relating to employees or agents of the Contractor or any of its Subcontractors, or the public.

1.06 ACCIDENT REPORTING

A. Serious accidents such as those resulting in treatment of an injury at a medical facility, response to the site by emergency medical personnel or damage to property other than that of the Contractor shall be reported to the Project Manager within twenty-four (24) hours of the occurrence.

B. A copy of each accident report, which the Contractor or subcontractors have submitted to their insurance carriers, shall be forwarded to the Project Manager as soon as possible, but under no circumstances shall it be forwarded later than seven (7) calendar days after the accident occurred.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 35 29

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SECTION 01 35 53
SECURITY PROCEDURES

PART 1 : GENERAL

1.01 SUMMARY

A. This Section includes the procedures to maintain security including unauthorized entry, vandalism, and theft to buildings and grounds at Project site.

1.02 SECURITY PROGRAM

A. At the Preconstruction Meeting specified in Section 01 31 19 - Project Meetings, discuss with the City a security program to prevent unauthorized entry and to protect against other security problems, including loss due to theft, vandalism, and fire.

B. Arrange with the City for access through locked gates as necessary to perform the Work of this Contract.

1.03 STORAGE AND PROTECTION

A. Provide for secure lockup of stored materials and take additional measures to protect against theft vandalism, and other loss of property belonging to the City located on site and at off-site facilities.

1.04 ENTRY CONTROL

A. The Contractor will be given access into the facility by the City's representative. Contractor is expected to maintain site security and lock gates outside of established working hours.

B. Restrict entrance of unauthorized persons and vehicles into construction areas.

C. Maintain security of City gates as approved by the City in advance.

D. Maintain security site lighting systems as approved by the City in advance.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 35 53

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 : GENERAL

1.01 SUMMARY

A. This Section addresses:

1. Furnishing, installing, operating, maintaining, and removal of temporary construction facilities.
2. Minimizing the pollution of air, water, or land; control of noise and the disposal of solid waste materials.

1.02 TEMPORARY FACILITIES

A. Meals and Lodging:

1. The City will not provide meal and lodging facilities for the Contractor's personnel.

B. Potable Water:

1. The Contractor shall make all necessary arrangements for a temporary potable water service.
2. The City has non-potable water at the site for wash-down and site cleaning. Contractor is responsible for determining if this water source is adequate for his/her operational needs. Water supply in excess of that provided by City shall be the responsibility of Contractor.

C. Electric Power:

1. The Contractor shall make all necessary arrangements for temporary electrical service. Contractor is responsible for providing licensed and qualified personnel to connect to power as well as all necessary permits and equipment.

D. Toilet Facilities:

1. The Contractor shall provide and maintain adequate chemical toilet facilities for all individuals connected with the Work.
2. Portable toilets to be positioned in locations where they will not pose a health problem or obstruct entry into the facility.
3. The Contractor shall keep the toilet facilities in sanitary condition in accordance with the Snohomish County Health Department.
4. The Contractor shall remove the toilet facilities at completion of the contract and shall disinfect the premises.

E. Telephone Service:

1. The Contractor shall make arrangements for temporary telephone service. All costs thereof shall be borne by the Contractor.

F. Parking:

1. There is limited parking on site.

G. On-Site Facility Access:

1. City of Everett WFP. Access for City personnel to this facility shall be maintained at all times (i.e. not blocking the access road).

H. Safety:

1. The Contractor shall take precautions to warn, protect, and prevent the public from all hazards that exist on site due to any construction operations. Stockpiled debris shall be surrounded with yellow warning tape attached to lath, stakes, poles, or fencing to warn the public of any potential hazard.

I. Solid Waste Disposal:

1. Collect solid waste on a daily basis.
2. Use only dump sites that are approved by the regulatory agency having jurisdiction, and present proof of approval upon request.
3. No building material wastes or unused building materials shall be buried, dumped, or disposed of on the site.

J. Fuel and Chemical Handling:

1. Store and dispose of chemical wastes in a manner approved by regulatory agencies.
2. Take special measures to prevent chemicals, fuels, oils, and greases from entering storm drains and drainage ways.
3. The Contractor shall provide containment around fueling and chemical storage areas to ensure that spills in these areas do not reach storm drains and/or waters of the state.

K. Existing Vegetation Protection:

1. The Contractor shall protect the vegetation in all areas within the site and all areas outside of the boundaries of the project site from damage by construction activities.
2. If the vegetation is damaged or destroyed by construction, the Contractor shall replace it with species and grade as required by the Engineer.

L. The Contractor shall maintain the construction area in a neat and orderly condition throughout the contract. Food and garbage shall be stored properly to prevent attracting animals. Remove food and garbage from the site during non-work hours. Practice controls to stop rodent infestation of temporary facilities and the job site.

M. Potential staging and stockpiling areas are limited on-site. The Contractor is responsible for securing a staging and stockpile area off-site if needed. Use of these areas will be determined in the pre-construction conference.

N. After completion of Work the Contractor shall remove all temporary facilities and shall restore all temporary facilities area(s) to the original state.

1.03 SITE MAINTENANCE

A. Contractor shall adhere to all requirements of federal, state, and local statutes and regulations dealing with pollution and shall ensure no public nuisances.

B. Contractor shall use only dump sites that are approved by the regulatory agency having jurisdiction, and present proof of approval upon request.

C. At all times, Contractor shall keep the work site, walkways, driveways, staging areas, and Contractor's facilities clean, orderly and free from rubbish and debris. Materials and equipment shall be removed from the site when they are no longer necessary. Upon completion of the work and before final acceptance, the work site shall be cleared of equipment, unused materials, and rubbish to present a clean and neat appearance in conformance with the present condition of the site.

1.04 MATERIAL DELIVERY AND STORAGE

A. Delivery of materials shall be made only during the Contractor's working hours and at such times as they have a representative available.

B. City personnel and equipment are not available for off-loading materials and/or equipment. Contractor shall make arrangements to have staff and equipment available for deliveries.

C. The Contractor shall store materials within the work site area at an area determined in pre-construction conference or designated by the City or at an off-site area if needed.

1.05 NOTIFICATIONS RELATIVE TO CONTRACTOR’S ACTIVITIES

A. The Contractor shall plan and schedule work activities to conform to and allow time for notifications, approvals, reviews, and other conditions of the Contract Documents. Contractor to notify the City of any spills or discharges on- or off-site related to the Work.

1.06 PREVENTION OF ENVIRONMENTAL POLLUTION AND PRESERVATION OF PUBLIC NATURAL RESOURCES

A. During the life of the Contract, the Contractor shall comply with all provisions of federal, state, and local statutes including the City of Everett Storm Water Manual, Design and Construction Standards, ordinances and regulations pertaining to the prevention of environmental pollution and the preservation of public natural resources. Pursuant to RCW 39.04.120 such provisions as are reasonably obtainable are set forth below.

1.07 WATER QUALITY

A. The Contractor shall comply with City ordinances, state, and federal laws and other regulations or rules applicable to water pollution occurring in Waters of the State and in Interstate Waters. The Contractor shall:

1. Exercise precautions throughout the life of the Contract to prevent pollution, erosion, siltation, and damage to property.
2. Provide for the protection of all water courses, including but not limited to streams, ditches, sewers, and storm drains intercepted during the progress of the Work.
3. Completely restore disturbed water courses in as good of a condition as the Contractor found them or make such final provisions for them as the City may direct.
4. Use all proper measures to provide for the free passage of surface water.
5. Remove and dispose of all surplus water, mud, silt, slicking, or other run off pumped from excavations or resulting from sluicing or pavement cleaning or other operations.

B. The Contractor shall comply with the regulations for water quality required by:

1. The Department of Ecology.
2. The Washington State Department of Fish and Wildlife.
3. Those federal statutes on oil spills enacted under the federal Water Pollution Control Act Amendments of 1972 (a copy of which may be obtained from the U.S. Environmental Protection Agency).
4. The water quality standards of the State of Washington as set forth in Chapter 173 201A WAC.
5. Any local statutes, regulations, ordinances, or rules, which stipulate the various types of discharge prohibited in public sewer systems or any drainage ditch in the local jurisdiction.

C. State statutes on water pollution covering liability of the Contractor, penalty for violation, liability and damages for injury or death of fish, animals or vegetation are set forth in Chapter 90.48 RCW. As an aid to the Contractor, some though not all, of the rules set forth by the various State departments are summarized below. The Contractor is cautioned, however, that each Department of the State may add other restrictions, as they deem necessary, to protect fish and to prevent air or water pollution:

1. State Department of Fish and Wildlife:
    a. Not degrade water quality in a way that would harm fish. (The Washington State Water Quality Regulations will serve as water quality criteria for the Work).
    b. Release into a flowing stream or open water any fish stranded by the Work.

c. Replant any stream bank or shoreline areas if the Work has disturbed the vegetative cover. (Any trees, brush, and grasses used in replanting shall resemble the type and concentration of surrounding vegetation, unless the Contract provides otherwise).

d. Provide an open water channel at the lowest level of any isolated pothole remaining when the Work is complete.

e. Protect fish by preventing harmful siltation on the bed or bottom of any body of water.

f. Not block stream flow or fish passage.

g. Keep all Equipment out of any flowing stream or other body of water (except as the Contract may permit).

h. Not remove gravel or other bottom material from within the high-water flow channel bed of any stream nor from the bottom of any other body of water (except as the Contract may permit).

i. Dispose of any Project debris beyond high-water flows.

2. State Department of Ecology:

a. Obtain a waste discharge permit from the Department of Ecology before:

1) Washing any aggregate and discharging water into a ground or surface waterway from pit sites or excavations when the water contains turbidity, silt, or foreign materials.

b. Provide the City with a copy of each waste discharge permit before starting the Work.

c. Control drainage and erosion to minimize the pollution of any waterway.

d. Dispose of all toxic materials (including creosote, oil, cement, concrete, and water used to wash equipment) in ways that will prevent them from entering State waters.

e. Dispose of all debris, overburden, and other waste materials in ways that will prevent them from entering State waters.

D. The Contractor shall perform such temporary work as may be necessary to effectively control water pollution, erosion, and related damage within the Project Site or which might be necessary at work areas located outside the Project Site. These outside areas may include, but are not limited to, equipment, material, and other storage sites. When temporary control facilities or measures are no longer needed, they shall be removed, and the areas restored or finished as designated by the Engineer.

E. If Work is suspended for an extended period of time, the Contractor shall be responsible for controlling erosion, pollution, sedimentation, and runoff during the shutdown period.

1.08 AIR QUALITY

A. The Contractor shall identify those portions of the Work that have the greatest potential to impact air quality.

1. Specific means and methods to prevent and/or control impacts to air shall be described for each such portion of work.

B. The Contractor shall not cause or allow the discharge of particulate matter, the emission of any air contaminants or odor bearing gases in excess of the limits specified under Regulation I of the Puget Sound Clean Air Agency, Article 9 Emission Standards.

C. The Contractor shall maintain air quality within the National Emission Standards for Hazardous Air Pollutants. Air pollutants are defined as that part of the atmosphere to which no ambient air quality standard is applicable, and which, in the judgment of the Administrator of the Environmental Protection Agency Clean Air Act, may cause or contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness.

D. The Contractor shall minimize the potential for air pollution by the use of emission control devices on Contractor operated equipment and by the shut-down of motorized equipment when not in use.

E. The Contractor shall control dust as specified in Paragraph 1.09 below, throughout the project.

F. No burning, including trash or vegetation, will be permitted.

G. Refer to Regulation III Puget Sound Clean Air Agency Article 4, Asbestos Control Standard, in the event the Contractor damages an existing duct, asbestos cement pipe, or any other facility that may contain asbestos. Repairs, removal, and containment shall be completed per WAC 296-62-07701 through 296-62-07753 as covered by chapter 49.17 RCW, Washington Industrial Safety and Health Act, RCW chapter 49.26.

1.09 DUST CONTROL

A. Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Do not apply water in quantities that would result in the creation of mud. Comply with all local regulations.

B. The Contractor shall not discharge smoke, dust, and other contaminants into the atmosphere that violate the regulations of any legally constituted authority. The Contractor shall abide by all applicable regulations enforced by the Puget Sound Clean Air Agency.

C. The Contractor shall minimize dust nuisance by cleaning, sweeping, vacuum sweeping, sprinkling with water or other means. The use of water, in amounts which result in mud on public streets, is not acceptable as a substitute for sweeping or other methods. Equipment for this operation shall be on the job site or available at all times as appropriate.

D. In the case of concrete work, the Contractor shall provide worker training and protection, as required, to meet applicable silica regulations and regulatory guidance regarding silica exposure.

1.10 NOISE CONTROL

A. The Contractor shall take all reasonable measures for the suppression of noise resulting from Work operations. Mobile engine driven cranes, loaders and similar material handling equipment; engines used in stationary service for standby power; air compressors for high- and low-pressure service; and other similar equipment shall be equipped with exhaust and air intake silencers designed for the maximum degree of silencing.

B. The Contractor shall conduct performance of the Work consistent with the applicable noise control levels set forth in the City of Everett Ordinance # 1556-89.

1.11 SPILL PREVENTION

A. The Contractor shall be responsible for prevention, containment, and cleanup of spilling of oil, fuel and other petroleum products used in the Contractor's operations. All such prevention, containment and cleanup costs shall be borne by the Contractor.

B. The Contractor shall develop and submit to the City for review a Spill Prevention, Control, and Countermeasure (SPCC) Plan in accordance with WSDOT Standard Specification Section 1-07.15(1).

C. The Contractor is advised that discharge of oil from equipment or facilities into State waters or onto adjacent land is not permitted under state water quality regulations.

D. The Contractor shall, at a minimum, take the following measures regarding oil spill prevention, containment, and cleanup:

1. Fuel hoses, lubrication equipment, hydraulically operated equipment, oil drums, and other equipment and facilities shall be inspected regularly for drips, leaks, or signs of damage, and shall be maintained and stored properly to prevent spills. Proper security shall be maintained to discourage vandalism.
2. All land-based oil and product storage tanks shall be diked or located so as to prevent spills from escaping to the water.
3. All visible floating oils shall be immediately contained with booms, dikes, or other appropriate means and removed from the water prior to discharge into State waters. All visible oils on land shall be immediately contained using dikes, straw bales, or other appropriate means and removed using sand, ground clay, sawdust, or other absorbent material, which shall be properly disposed of by the Contractor. Waste materials shall be temporarily stored in drums or other leakproof containers after cleanup and during transport to disposal. Waste materials shall be disposed of off the property at an approved site.

4. Maintain at each job site a spill kit(s) that is/are sufficient to contain and clean up any and all quantity of oils, hydraulic fluid, and other chemicals to be stored or stockpiled at the Site.

1.12 LIABILITY AND PAYMENT

A. The Contractor shall be liable for the payment of all fines and penalties resulting from failure to comply with the federal, state, and local pollution control regulations even though the City is on the job at the time of the violation.

B. Except as may be otherwise provided for in the Contract, costs pertaining to the prevention of environmental pollution and the preservation of public natural resources as outlined in the Contract shall be considered as incidental to the Work and such costs shall be included in the Lump Sum Bid item price for the Work comprise in the Contract.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 50 00

SECTION 01 60 00
MATERIALS AND EQUIPMENT

PART 1 : GENERAL

1.01 DELIVERING AND HANDLING

A. Delivering:

1. Contractor shall arrange deliveries of products in accordance with construction schedule and be responsible for accepting and coordinating deliveries at the project site.
2. City staff and equipment will not be available for coordinating and offloading of materials and equipment that is delivered.
3. Do not provide materials that have exceeded their shelf life.
4. Immediately after delivery, inspect shipments to assure compliance with requirements of Contract Documents and assure products are protected and undamaged.

B. Handling:

1. Provide equipment and personnel to handle products and materials by methods that will prevent damage to products and materials.

1.02 STORING AND PROTECTING

A. General Storing Requirements:

1. Store materials in a protected area that maintains humidity and temperature within the range recommended by materials and equipment manufacturers.
2. Cover products which are subject to deterioration with impervious sheet vapor coverings and provide adequate ventilation.

B. Protecting Products after Installation:

1. Provide substantial temporary coverings as necessary to protect installed products from damage resulting from subsequent construction operations and/or weather.
2. Remove temporary coverings when no longer needed.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

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SECTION 01 64 10
INSTALLATION OF OWNER-FURNISHED EQUIPMENT

PART 1 : GENERAL

1.01 SUMMARY

A. Scope:

1. The Owner-Furnished Equipment listed herein includes two categories of equipment. The first category is equipment that has been purchased by the Owner, has been or will be delivered to the project site prior to the start of construction and will be moved by the Contractor, hereinafter designated “Owner-Furnished Equipment – Delivered.” The second category is equipment that is existing and will be transferred from the existing air scour blower building to the new blower building, hereinafter designated “Owner-Furnished Equipment – Existing.” See electrical specifications for electrical and control equipment to be transferred from the existing blower building to the new blower building.
2. Contractor shall furnish all labor, materials, equipment, and incidentals as shown, specified, and required for installation of the Owner-Furnished Equipment in Paragraph B below.
    a. Shipments of materials to the Contractor shall be delivered to the site only during regular working hours. Shipments shall not be delivered to Owner, except where otherwise directed.
    b. If the Contractor feels it is necessary to move stored materials and equipment during construction, the Contractor shall move materials and equipment without any additional compensation.
3. The Contractor is responsible for the installation of the Owner-Furnished Equipment as described in the Contract Drawings.
4. The Contractor shall be responsible for assembling and installing the equipment in accordance with the manufacturer’s instructions.
5. The Contractor shall bear the risk of all loss, deterioration, or damage to the equipment during demolition, delivery, unloading, and moving and installation of the equipment.
6. The Owner will obtain shop drawings, descriptive literature, installation, and operating instructions from equipment manufacturers.

B. Owner-Furnished Equipment:

1. Owner-Furnished Equipment – Delivered includes:
    a. Multistage Centrifugal Blower by Gardner Denver Nash on a metal frame (Frame No. 1265). The blower is a 1260 Series Blower, Model 1265-A/GDGI. The blower has a capacity of 3,825 SCFM at 5.8 total PSIG outlet pressure. The inlet conditions are 14.40 PSIA Barometer. The motor is 200 HP at 3,570 RPMs.

1) Available documentation on this equipment is included in Appendix B – Owner-Furnished Equipment Documentation.

2) Additional requirements related to this equipment are included in Division 40 of the specifications.

3) The approximate value of this equipment is $80,000.

4) The blower has been delivered and is on site at the WFP. The Contractor shall coordinate with the Owner for access to the building where the blower is stored. The Contractor shall schedule moving and installing the blower in the new blower building at least 14 days in advance with the Owner.

b. Blower Auxiliary Equipment includes:

1) 12” Expansion Joint by Hoffman Lamson, Part Number HF00485050. Quantity = 1.

2) 10” Intake Filter Silencer by Hoffman Lamson, Part Number VP1012718. Quantity = 1.

3) 6” x 6” x 1” Isolation Base Pads by Gardner Denver, Part Number VP1003074. Quantity = 8.

4) 0-15 PSI Pressure Guage by Gardner Denver, Part Number 27P333. Quantity = 1.

5) 12” Butterfly Valve with Lever Actuator by Hoffman Lamson, Part Number BA-106112. Quantity = 2.

6) 12” Check Valve by Hoffman Lamson, Part Number BA-1006090000. Quantity = 1.

7) Available documentation on this equipment is included in Appendix B – Owner-Furnished Equipment Documentation.

8) Additional requirements related to this equipment are included in Division 40 of the specifications.

9) The approximate value of this equipment is $14,400.

10) Blower auxiliary equipment has been delivered and is on site at the WFP. The Contractor shall coordinate with the Owner for access to the building where the equipment is stored. The Contractor shall schedule moving and installing the equipment in the new blower building at least 14 days in advance with the Owner.

c. Blower Sensor and Isolation Base Pad Equipment includes:

1) Blower Vibration Sensor by Hoffman Lamson, Part Number VP1024035. Quantity = 4.

2) Blower Bearing RTD Sensor by Hoffman Lamson, Part Number BB-1028697, with Copper Washer by Hoffman Lamson, Part Number BB-1142000. Quantity = 4.

3) 6” x 6” x 1” Isolation Base Pads by Gardner Denver, Part Number VP1003074. Quantity = 8.

4) Available documentation on this equipment is included in Appendix B – Owner-Furnished Equipment Documentation.

5) Additional requirements related to this equipment are included in Division 40 of the specifications.

6) The approximate value of this equipment is $9,200.

7) Blower Sensor and Isolation Base Pad Equipment will be delivered to the project site prior to the start of construction. The Contractor shall coordinate with the Owner for access to the building where the equipment is stored. The Contractor shall schedule moving and installing the equipment in the new blower building at least 14 days in advance with the Owner.

d. Duplex Rotary Screw Air Compressor, Dryer Assembly, and Receiver Tank by Champion, Model L07. The discharge pressure is 125 PSIG with a capacity of 38.7 ACFM. The compressor motor size is 10 HP for each compressor. The compressor assembly also includes an oil mist eliminator by Champion, Model CME250.

1) Available documentation on this equipment is included in Appendix B – Owner-Furnished Equipment Documentation.

2) Additional requirements related to this equipment are included in Division 40 of the specifications.

3) The approximate value of this equipment is $22,000.

4) The duplex compressor has been delivered and is on site at the WFP. The Contractor shall coordinate with the Owner for access to the building where the compressor is stored. The Contractor shall schedule moving and installing the compressor in the new blower building at least 14 days in advance with the Owner.

2. Owner Furnished Equipment – Existing includes:

a. Multistage Centrifugal Blower

1) The existing blower is generally matched with the new blower. The existing blower is a 1250 Series Blower, Model 1255-0-0-0-5-0-AD by Lamson Corporation.

2) Available documentation on this equipment is included in Appendix B – Owner-Furnished Equipment Documentation.

3) The Contractor shall coordinate with the Owner for access to the building where the existing blower is stored. The Contractor shall schedule moving and installing the existing blower in the new blower building at least 14 days in advance with the Owner.

4) See Division 26 and the Drawings for reuse of existing electrical and control equipment from the existing air scour blower building.

C. Contractor-Supplied Items:

1. Unless specific accessories and appurtenances are listed and shown as being provided by the Owner, the Contractor shall provide all equipment, piping, valves, pipe supports, and appurtenances as shown on the drawings, as specified herein, and as required for a complete installation.

2. Items not listed or specified, but necessary for a complete, secure, and functional installation shall be supplied and installed by the Contractor. Additional items that may be necessary to complete the installation include, but are not limited to:

a. Interconnecting piping, manual valves, flexible connections, and fittings.

b. Concrete foundations, anchors, supports and structural attachments.

c. Miscellaneous supports and fasteners.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Install Owner-Furnished Equipment in accordance with manufacturer's instructions, as shown on Drawings, and as specified.

B. Contractor shall coordinate installation of all electrical, mechanical, and structural features related to the Owner-Furnished Equipment. It is the responsibility of the Contractor to provide a complete, operational, properly tested and functioning system, as described in the Drawings and as specified.

3.02 EQUIPMENT STARTUP AND TESTING

A. General:

1. The Contractor shall coordinate and provide the services of qualified manufacturer representatives for equipment installation, startup, and inspection. This includes on-site startup assistance for the new and existing blowers; inspection of the existing blower; installation of temperature and vibration sensors on the new and existing blowers; and startup of the new air compressor. The manufacturer's representative shall be onsite prior to and following startup of the equipment. The manufacturer's representative shall certify that the equipment is properly installed and functions correctly. The Contractor shall coordinate with the equipment manufacturer to schedule these services.

2. The Contractor shall be present during the checkout, startup and calibration period. The Contractor shall correct any deficiencies noted in the work to make the system complete and functional.

3. The Contractor is responsible for equipment startup and testing as specified in Section 01 91 10 - Facility Startup and Testing.

END OF SECTION 01 64 10

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SECTION 01 74 23
FINAL CLEANING

PART 1 : GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for final cleaning of the Work prior to Substantial Completion, including but not limited to:

1. Cleaning procedures.
2. Inspection.

B. Do not use cleaning materials that may damage concrete, metal, or paved surfaces.

C. Do not use cleaning materials hazardous to health or property.

1.02 FINAL CLEANING

A. Clean project site (yard, grounds, asphalt pavement, and new blower building) of litter and foreign substances. Sweep or hose paved areas to a broom-clean condition free of dust. Remove stains, petro-chemical spills, and other foreign deposits. Rake grounds which are neither planted nor paved to a smooth, even-textured surface.

B. Except as otherwise indicated or requested by the City, remove temporary protection devices and facilities installed to protect previously completed work during the remainder of the construction period.

1.03 INSPECTION

A. Prior to requesting inspection for certification of Substantial Completion, inspect exposed surfaces. Verify entire Work area is clean.

B. Prior to certifying Substantial Completion, the City will make a detailed inspection of site and will prepare a check list of cleaning and debris removal remaining to be completed before certification of Substantial Completion. Complete items on the City's check list, so that entire Project is clean and ready for occupancy by staff and public.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 74 23

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SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 : GENERAL

1.01 SUMMARY

A. Supplemental requirements to the General Conditions of the Contract and Specifications for administrative procedures in closing out the Work.

B. All conditions specified within Section 00 72 00 - General Conditions apply to this specification.

1.02 REQUIREMENTS FOR ACHIEVING SUBSTANTIAL COMPLETION

A. Prior to requesting the City's inspection for certification of Substantial Completion, the Contractor must meet the following requirements:

1. The grounds directly adjacent and surrounding and the new blower building and all storage and lay down areas shall be sufficiently cleaned with all construction material removed, to allow the unrestricted use of the facility.
2. Submittal of pay request for all items completed in order to satisfy the requirements of Substantial Completion.
3. Notification requesting that a Substantial Completion has been attained is to be submitted on the attached form. Once the City concurs with Contractor that Substantial Completion has been attained, the City will proceed with the development of a punch list and establishing the Substantial Completion Date.

B. Process to achieve Substantial Completion:

1. Upon receipt of Contractor's request and if the City concurs that substantial completion has been met, the punch list inspection will be scheduled within ten (10) working days of the notification. If the City determines that the project is not Substantially Complete, the City will notify the Contractor of the portions of the Work that must be completed before a punch list inspection can be scheduled.
2. The City shall be responsible for preparing the punch list based upon the results of the inspection. If the inspection reveals that the Work is not Substantially Complete, the process in 1.02.B.1 shall be repeated, and the previously established Substantial Completion Date will be withdrawn until those items of work remaining to be completed have been completed.
3. After inspection confirms that the Work is Substantially Complete, the City shall prepare the Certificate of Substantial Completion establishing the date of Substantial Completion and provide a copy to the Contractor with a copy of the punch list. The date of Substantial Completion shall be used to determine the cut-off date for liquidated damages.

1.03 REQUIREMENTS FOR ACHIEVING PHYSICAL COMPLETION

A. The Contractor shall show evidence of compliance with requirements of the following:

1. All deficiencies identified on the punch list have been corrected.
2. Upon correction of all punch list items, the Contractor shall notify the City on the attached form that physical completion has been achieved and request scheduling of the final punch list inspection.

B. Process to Achieve Physical Completion:

1. Upon receipt of the Contractor's request for final inspection, the City, within five (5) working days, shall schedule a final punch list inspection.
2. The City shall prepare the final punch list inspection report based upon the results of the inspection.
3. After inspection shows that all punch list items have been corrected, the City shall prepare the Certificate of Physical Completion establishing the Physical Completion Date and provide a copy to the Contractor.

1.04 FINAL CLEANUP

A. At the completion of the Work, leave the premises in a neat, unobstructed condition and everything in repair and adjustment.

B. Remove all tools, materials, and equipment from the premises as soon as possible, upon completion of the Work of the Contract.

C. Remove erosion control or spill containment fencing.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

(Certificate of Substantial Completion and Certificate of Physical Completion form letters follow)

CERTIFICATE OF SUBSTANTIAL COMPLETION

Date: _____

Randy Loveless, P.E.
City of Everett Public Works Department
3200 Cedar Street
Everett, WA. 98201

Re: WFP Air Scour Blower Building Replacement

The Work performed under this Contract has been substantially completed. The Contractor,

_____, hereby requests a Punch List Inspection of Substantial Completion and establishment of the date of Substantial Completion.

The Contractor will complete or correct the Work on the punch list within 5 working days from the date of Substantial Completion established by the City.

_____	_____	_____
Contractor	By	Date

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CERTIFICATE OF PHYSICAL COMPLETION

Date: _____

Randy Loveless, P.E.
City of Everett Public Works Department
3200 Cedar Street
Everett, WA. 98201

Re: WFP Air Scour Blower Building Replacement

The Work items identified in the inspection punch list have been completed. The Contractor, _____, hereby requests certification of Physical Completion and establishment of the date of Physical Completion and the beginning of the warranty period.

The Contractor understands that the City will assume maintenance for items within the facility that does not conflict with warranties or maintenance of specified items indicated within the contract documents or in any way relieves the contractor of any responsibilities and warranties of the facility. The contractor understands that the application for physical completion is not the date that the warranties start but that the date shall be set by the date indicated on the Certificate of Completion Form signed and dated by the Mayor as recommended by city council.

_____ _____ _____
Contractor By Date

END OF SECTION 01 77 00

SECTION 01 79 39.13
RECORD DRAWINGS

PART 1 : GENERAL

1.01 SUMMARY

A. The Contractor shall maintain one (1) set of full-size Drawings for Record Drawings, updated with clear and accurate, red-lined field revisions on a daily basis, and within two (2) business days after receipt of information that a change in Work has occurred. The Contractor shall not conceal any work until the required information is recorded.

B. This Record Drawing set shall be used for this purpose alone, shall be kept separate from other Plan sheets, and shall be clearly marked as Record Drawings. These Record Drawings shall be kept on site at the Contractor's field office and shall be available for review by the Contracting Agency at all times. The Contractor shall bring the Record Drawings to each progress meeting for review.

C. The quality of the Record Drawings, in terms of accuracy, clarity, and completeness, is to be adequate to allow the Contracting Agency to modify the computer-aided drafting (CAD) Contract Drawings to produce a complete set of Record Drawings for the Contracting Agency without further investigative effort by the City.

D. The Record Drawing markups shall document all changes in the Work, both concealed and visible. Items that must be shown on the markups include but are not limited to:

1. Actual dimensions, arrangement, and materials used when different than shown in the Drawings.
2. Changes made by Change Order or Field Order.
3. Changes made by the Contractor.
4. Accurate locations of storm sewer, sanitary sewer, water mains and other water appurtenances, structures, conduits, light standards, vaults, width of roadways, sidewalks, landscaping areas, building footprints, channelization, and pavement markings, etc. Include pipe invert elevations, top of castings (manholes, inlets, etc.).

E. When the Contract calls for the Contractor to do the surveying/staking, the applicable tolerance limits include, but are not limited to the following:

	Vertical	Horizontal
As-built sanitary & storm invert and grate elevations	± 0.01 foot	± 0.01 foot
As-built monumentation	± 0.001 foot	± 0.001 foot
As-built waterlines, inverts, valves, hydrants	± 0.10 foot	± 0.10 foot
As-built ponds/swales/water features	± 0.10 foot	± 0.10 foot
As-built buildings (fin. Floor elev.)	± 0.01 foot	± 0.10 foot
As-built gas lines, power, TV, Tel, Com	± 0.10 foot	± 0.10 foot
As-built signs, signals, etc.	N/A	± 0.10 foot

F. Making Entries on the Record Drawings:

1. Use erasable colored pencil (not ink) for all markings on the Record Drawings, conforming to the following color code:
   a. Additions - Red
   b. Deletions - Green
   c. Comments - Blue
   d. Dimensions - Graphite
2. Provide the applicable reference for all entries, such as the change order number, the request for information (RFI) number, or the approved shop drawing number.
3. Date all entries.
4. Clearly identify all items in the entry with notes similar to those in the Contract Drawings (such as pipe symbols, centerline elevations, materials, pipe joint abbreviations, etc.).

G. The Contractor shall certify on the Record Drawings that said drawings are an accurate depiction of built conditions, and in conformance with the requirements detailed above. The Contractor shall submit final Record Drawings to the City. City acceptance of the Record Drawings is one of the requirements for achieving Physical Completion.

PART 2 : PRODUCTS

Not Used

PART 3 : EXECUTION

Not Used

END OF SECTION 01 79 39.13

SECTION 01 91 10
FACILITY STARTUP AND TESTING

PART 1 : GENERAL

1.01 SUMMARY

A. The Contractor shall be responsible for Preliminary Adjustments and Testing, assistance with Facility Operational Test and Confidence Operation Test of the completed facility. The Contractor shall arrange for, and pay all costs associated with the services of the manufacturer's representatives to assist with startup and testing of the systems and/or equipment as specified in this Section and individual equipment sections, unless otherwise specified. Facility Startup and Testing also applies to the systems and/or equipment specified in the Special Provisions and Drawings.

1.02 PRELIMINARY ADJUSTMENTS AND TESTING

A. All systems and/or equipment shall be tested, calibrated, and adjusted by the manufacturer's representative prior to placement in operation. The Contractor shall submit to the Engineer a plan detailing the procedures for Preliminary Adjustments and Testing, including the name and phone number of the manufacturer's field representative, an outline of the work to be performed, and the date the work will be completed. The procedures shall be submitted at least fifteen (15) Working Days prior to commencement of preliminary adjustments and testing.

B. Preliminary adjustment and testing shall include, but not be limited to, visual inspection for damage or missing parts, lubrication, alignment check, calibration, and functional testing. Any malfunctioning equipment or systems shall be immediately repaired and/or replaced and/or adjusted and revised.

C. Due to operational considerations, it may not be possible to run systems and/or equipment under actual operating conditions during the initial site visit by the manufacturer's field representative. The Contractor shall anticipate that multiple site visits by the manufacturer's field representative may be necessary to complete preliminary adjustments and testing.

D. The Engineer will not perform Facility Operational Test until all preliminary adjustments and testing have been completed and documented. The Contractor shall provide to the Engineer written confirmation from the manufacturer's field representative that the applicable system and/or equipment has been tested, the results of the tests, and that the system and/or equipment is ready for operation.

E. At a minimum, it is required that the Supplier’s and/or Manufacturer’s Representative perform Preliminary Adjustments and Testing for the equipment specified in the following CSI divisions:

Division	Title
23	HVAC
26	Electrical
26 & 40	Control Panel
28	Access Control
40	Blower and Air Compressor

F. The Contractor shall provide the services of the manufacturer's field representative for Preliminary Adjustments and Testing for the number of site visits and duration of on-site time as required to complete Preliminary Adjustments and Testing. If, during commencement of the Facility Operational Test, the Engineer determines that the facility is not ready for operational testing and startup, the Contractor will be required to complete Preliminary Adjustments and Testing before proceeding with the Facility Operational Test.

1.03 FACILITY OPERATIONAL TEST

A. The Contractor shall provide written notice to the Engineer when Preliminary Adjustments and Testing of the facility has been completed. The Contractor shall certify that all systems have been tested and are operational. This certification is required before Facility Operational Test will be performed.

B. The Contractor shall anticipate that up to 10 working days from notification may be required to schedule participants in Facility Operational Test. The Engineer and City staff will perform the Facility Operational Test to verify that all systems perform in accordance with the Drawings and Specifications.

C. The Contractor shall coordinate the services of manufacturer's representatives, as required, to assist with the Facility Operational Test. Manufacturer's representatives shall include, but not be limited to, those listed in Paragraph 1.02, above. The Contractor shall anticipate that Facility Operational Test activities may hinder or delay the Contractor. No additional compensation will be paid, or extension of Contract Time will be made to the Contractor, for assistance or delays caused by, or resulting from, the Facility Operational Test.

D. The Contractor shall immediately correct deficiencies discovered during the Facility Operational Test. The Contractor shall anticipate that the Engineer may re-test deficient systems to determine if the corrections are satisfactory.

1.04 CONFIDENCE OPERATION TEST

A. When the Engineer and Owner determine that the site is operational, the Contractor shall perform the Confidence Operation Test of the site. The Confidence Operation Test shall include the following activities:

1. Manual operation of each blower independently for a 30-minute period to validate normal operational parameters.
2. Manual operation of the compressor under normal operating procedures.

3. Operation of the control system in the automatic mode for a 24-hour test period.

B. The Engineer and the Owner will monitor the Confidence Operation Test. Any operational failure or alarm condition will result in invalidation of the current Confidence Operation Test. The Contractor shall perform the necessary repairs and/or adjustments and re-test the defective system to verify it is performing as specified. The Contractor shall re-start the Confidence Operational Test and continue the activities indicated above without failure.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 91 10

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SECTION 01 91 11
FACILITY TRAINING

PART 1 : GENERAL

1.01 SUMMARY

A. The Contractor shall arrange for, and pay all costs associated with the services of the manufacturers' representatives to provide training to the City of Everett staff in operation and maintenance of the system and/or equipment listed in Paragraph 1.02, below, unless otherwise specified.

1.02 SYSTEMS AND EQUIPMENT

A. Training shall be provided as specified in the CSI Specifications and Special Provisions. The session duration indicated shall be the minimum necessary. Additional time may be added if recommended by the manufacturer's representative.

B. The schedule for the training sessions shall be coordinated by the Contractor with the Owner. The training sessions shall be conducted by the manufacturer's representative following the Confidence Operation Test.

C. At a minimum, the following specifications sections require the Supplier's or Manufacturer's Representative to perform Owner training:

Division	Title
01	General Requirements – Owner-Furnished Equipment
23	HVAC
26	Electrical
28	Electronic Safety and Security

D. The Contractor shall provide and pay all costs associated with up to three days of training to City staff on the new and existing blower, and new air compressor by qualified vendors and/or manufacturer representatives.

1.03 AGENDA

A. The training session agenda shall include, but not be limited to, the following:

1. Overview of function of the system or equipment.
2. Preventative maintenance procedures.
3. Troubleshooting.
4. Adjustment and calibration.
5. Operational testing.
6. Replacement of components.
7. Operation in manual and automatic modes.
8. Question and answer period.

B. A specific agenda shall be prepared by the manufacturer's representative for each item listed in Paragraph 1.02 above. The agenda shall be submitted to the Engineer for review at least fifteen (15) Working Days prior to the scheduled training session. Upon acceptance of the agenda by the Engineer, the manufacturer's representative shall prepare a final agenda and instructional materials. The Contractor shall submit six (6) copies of the agenda and instructional materials to the Engineer at least five (5) Working Days prior to the scheduled training session.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 91 11

SECTION 01 91 12
OPERATION AND MAINTENANCE DATA

PART 1 : GENERAL

1.01 SUMMARY

A. The Contractor shall arrange for, and pay all costs associated with the services of the manufacturer's representative to prepare operation and maintenance data for the system and/or equipment listed in Paragraph 1.02, below.

1.02 SYSTEM AND EQUIPMENT

A. Provide operation and maintenance data for the following system and/or equipment:

Division	System or Equipment
01	General Requirements – Owner-Furnished Equipment
23	HVAC
26	Electrical
28	Electronic Safety and Security

1.03 INITIAL SUBMITTAL

A. The Contractor shall submit two (2) hard copies and searchable electronic version (PDF format) of the initial submittal to the Engineer for review. The initial submittal shall be received by the Engineer at least twenty (20) Working Days prior to Confidence Operation Test. The submittal shall be prepared by the manufacturer's representative. The initial submittal may be delivered in multiple parts to the Engineer but shall be complete for each Section specified above.

B. The initial submittal for each item listed in Paragraph 1.02, above, shall include, but not be limited to, the following items. Each initial submittal shall be bound in a three-ring binder or pressboard report cover. The binder shall be organized in a consistent format with tabbed dividers for each item. All information shall be specifically for the installed components. Data sheets which cover multiple equipment or list options shall be marked to indicate the installed equipment, including provided options. All other equipment or options shall be crossed out.

Item No.	Description
1	Fly sheet indicating: Owner's name; description of equipment; manufacturer's name, address, and telephone number; and local supplier/ representative's name, address, and telephone number.
2	Detailed index indicating submittal contents, with major headings related to tabbed dividers.
3	Assembly drawings
4	Parts list and/or bill of materials
5	Wiring diagrams
6	Lubrication instructions, including type and frequency
7	Preventative and periodic maintenance summary
8	Operating instructions
9	Startup and shutdown procedures
10	Overhaul and parts replacement instructions
11	Source for parts
12	Testing and troubleshooting procedures
13	Identification of critical safety issues
14	Performance curves
15	Factory test data
16	List of recommended spare parts
17	List of expendable parts (i.e., air or oil filters)
18	Warranty

C. The Engineer will review the initial submittal and return it to the Contractor for incorporation of review comments.

1.04 INTEGRATED DOCUMENT

A. After the Contractor receives the corrected initial submittals for all items listed in Paragraph 1.02, above, the Contractor shall assemble all components into an integrated document. The submittals shall be bound in three-inch capacity, vinyl covered, three-ring binders. The integrated document shall consist of as many volumes as necessary to contain the data. A binder with less than three-inch capacity may be used for the last volume, if appropriate. Each volume shall include, but not be limited to, the following:

1. The front cover and binding edge shall have typed labels identifying the project, Owner, volume number, and facility area included.
2. Detailed index indicating the contents of the volume by facility area and major headings.
3. Tabbed dividers for each facility area.
4. Approved operation and maintenance data arranged by facility area number in ascending order, regardless of manufacturer.
5. Oversize (larger than 11"x17") prints shall be inserted in bound-in kraft or kevlar envelopes, placed at the end of the applicable area or subarea.

B. The Contractor shall submit one (1) hard copy and one (1) searchable electronic version (PDF format) of the integrated document to the Engineer prior to Substantial Completion of the work. The Engineer will review the integrated document. If the integrated document does not meet the requirements of this Section, the Engineer will return to the Contractor for corrections. The submittal process shall be repeated until the integrated document (hard copy and electronic version) is acceptable. The Contractor shall then submit two (2) total hard copies and one (1) searchable electronic version (PDF format) of the accepted, integrated operation and maintenance document to the Owner. The Contractor shall anticipate that Final Acceptance may be delayed by the Owner if the integrated document is not acceptable to the Engineer.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 01 91 12

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SECTION 03 00 00
CONCRETE GENERAL REQUIREMENTS

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers general requirements and quality assurance provisions for all cast-in-place concrete.

1.02 DEFINITIONS

A. Concrete Field Testing Technician: A person who has demonstrated knowledge and ability, and has credentials that are current with ACI, ICC, WABO, or other recognized certifying organizations, to perform and record the results of ASTM standard tests on freshly mixed concrete, and to make and cure test cylinders.

B. Architectural Concrete: Concrete that is exposed as an interior or exterior surface in the completed structure and which requires special care in the selection of the concrete materials, forming, placing, and finishing to obtain the desired architectural appearance.

C. Exposed To Public View: Situated so that it can be seen from a public location after completion of the building.

D. High Early Strength Concrete: Concrete which, through the use of high early strength cement or admixtures, is capable of attaining specified strength at an earlier age than normal concrete.

E. Lightweight Concrete: Concrete of substantially lower unit weight than concrete made using gravel or crushed stone aggregates.

F. Mass Concrete: Any volume of concrete with dimensions large enough to require that measures be taken to cope with generation of heat from hydration of the cement and attendant volume change to minimize cracking.

G. Mass Concrete, Plain: Mass concrete containing no reinforcement or less reinforcement than necessary to be considered reinforced mass concrete.

H. Mass Concrete, Reinforced: Mass concrete containing adequate reinforcement, prestressed or non-prestressed, designed to act together with the concrete in resisting all forces, including those induced by temperature and shrinkage.

I. Normal Weight Concrete: Concrete having a unit weight of approximately 150 pounds per cubic foot made with gravel or crushed stone aggregates.

J. Post-Tensioning: A method of prestressing reinforced concrete in which tendons are tensioned after the concrete has hardened.

K. Prestressed Concrete: Concrete where internal stresses of such magnitude and distribution are introduced that the tensile stresses resulting from the service loads are counteracted to a desired degree; in reinforced concrete, the prestressing is commonly introduced by tensioning tendons.

L. Reference Standards: Standards of a technical society, organization, or association, including the codes of local or state authorities, which are referenced in the Contract Documents.

M. Strength Test: The average of the compressive strengths of two cylinders made from the same sample of concrete and tested at 28 days or at test age designated for determination of f_C'.

N. Structural Lightweight Concrete: Structural concrete made with lightweight aggregate; the unit weight usually is in the range of 90 to 115 lb/ft^3.

O. Submitted: Submitted to the Engineer for review and acceptance.

P. Work: The entire construction or separately identifiable parts thereof which are required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

1.03 ABBREVIATIONS

A. Abbreviations for organizations issuing documents referred to in the specifications are listed below:

1.	AASHTO	American Association of State Highway and Transportation Officials
2.	ACI	American Concrete Institute
3.	ASTM	American Society for Testing and Materials
4.	AWS	American Welding Society
5.	CRSI	Concrete Reinforcing Steel Institute
6.	ICC	International Code Council
7.	PTI	Post-Tensioning Institute
8.	WABO	Washington Association of Building Officials
9.	WSDOT	Washington State Department of Transportation

1.04 REFERENCES

A. Standards of ACI, ASTM, and AWS referred to herein are listed with serial designation and are part of the Specifications. Use the latest edition as of 30 days prior to the bid date.

B. ACI Standards:

1.	ACI 117	Specifications for Tolerances for Concrete Construction and Materials
2.	ACI 347	Guide to Formwork for Concrete

C. ASTM Standards:

1.	A184/A184M	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
2.	A416/A416M	Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete
3.	A421/A421M	Standard Specification for Stress-Relieved Steel Wire for Prestressed Concrete
4.	A615/A615M	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
5.	A706/A706M	Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
6.	A722/A722M	Standard Specification for High-Strength Steel Bars for Prestressed Concrete
7.	A767/A767M	Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
8.	A775/A775M	Standard Specification for Epoxy-Coated Reinforcing Steel Bars
9.	A779/A779M	Standard Specification for Steel Strand, Seven-Wire, Uncoated, Compacted for Prestressed Concrete
10.	A780/A780M	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
11.	A884/A884M	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
12.	A996/A996M	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
13.	A1064/A1064M	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
14.	C31/C31M	Standard Practice for Making and Curing Concrete Test Specimens in the Field
15.	C33/C33M	Standard Specification for Concrete Aggregates
16.	C39/C39M	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
17.	C42/C42M	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

18.	C94/C94M	Standard Specification for Ready-Mixed Concrete
19.	C138/C138M	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
20.	C143/C143M	Standard Test Method for Slump of Hydraulic-Cement Concrete
21.	C150/C150M	Standard Specification for Portland Cement
22.	C171	Standard Specification for Sheet Materials for Curing Concrete
23.	C172/C172M	Standard Practice for Sampling Freshly Mixed Concrete
24.	C173/C173M	Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method
25.	C192/C192M	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
26.	C231/C231M	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
27.	C260/C260M	Standard Specification for Air-Entraining Admixtures for Concrete
28.	C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
29.	C330/C330M	Standard Specification for Lightweight Aggregates for Structural Concrete
30.	C387/C387M	Standard Specification for Packaged, Dry, Combined Materials for Concrete High Strength Mortar
31.	C404	Standard Specification for Aggregates for Masonry Grout
32.	C494/C494M	Standard Specification for Chemical Admixtures for Concrete
33.	C567/C567M	Standard Test Method for Determining Density of Structural Lightweight Concrete
34.	C595/C595M	Standard Specification for Blended Hydraulic Cements
35.	C597	Standard Test Method for Pulse Velocity Through Concrete
36.	C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
37.	C685/C685M	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
38.	C803/C803M	Standard Test Method for Penetration Resistance of Hardened Concrete

39.	C805/C805M	Standard Test Method for Rebound Number of Hardened Concrete
40.	C873/C873M	Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds
41.	C881/C881M	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
42.	C900	Standard Test Method for Pullout Strength of Hardened Concrete
43.	C928/C928M	Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs
44.	C989/C989M	Standard Specification for Slag Cement for Use in Concrete and Mortars
45.	C1017/C1017M	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
46.	C1059/C1059M	Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete
47.	C1064/C1064M	Test Method for Temperature of Freshly Mixed Portland Cement Concrete
48.	C1074	Standard Practice for Estimating Concrete Strength by the Maturity Method
49.	C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
50.	C1107/C1107M	Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
51.	D98	Standard Specification for Calcium Chloride
52.	D994/D994M	Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
53.	D1751	Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
54.	D1752	Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
55.	E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
56.	E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

D. Other Referenced Standards:

Other standards referenced herein:

1.	AWS D-1.4		Structural Welding Code-Reinforcing Steel
2.	AASHTO T260		Sampling and Testing for Total Chloride Ion in Concrete and Concrete Materials
3.	Corps of Engineers:		
	a.	CRD C513	Specification for Rubber Waterstops
	b.	CRD C572	Specification for Polyvinyl-Chloride Waterstops
4.	PTI		Specification for Unbonded Single-Strand Tendons
5.	WSDOT		Standard Specifications for Road, Bridge and Municipal Construction

E. Cited Publications:

Publications cited in this Specification:

1.	ACI 315	Details and Detailing of Concrete Reinforcement
2.	ACI 318	Building Code Requirements for Reinforced Concrete
3.	ACI CPI	Technician Workbook for ACI Certification of Concreted Field Testing Technician – Grade I
4.	ACI SP	Field Reference Manual
5.	CRSI MSP-	Manual of Standard Practice

1.05 SUBMITTALS

A. Testing agencies shall report results of concrete and concrete materials tests and inspections performed during the course of the work to the Owner, Engineer, Contractor, and the Concrete Supplier. Strength test reports shall include location in the Work where the batch represented by test was deposited and the batch ticket number. Reports of strength tests shall include detailed information of storage and curing of specimens prior to testing. Final reports shall be provided within seven (7) days of test completion.

1.06 QUALITY ASSURANCE

A. General: Concrete materials and operations may be tested and inspected by the Owner as Work progresses. Failure to detect defective work or material shall not prevent rejection later when a defect is discovered nor shall it obligate Engineer for final acceptance.

B. Testing Agencies: Agencies that perform testing services on concrete materials shall meet the requirements of ASTM C1077. Testing agencies that perform testing services on reinforcing steel shall meet the requirements of ASTM E329. Testing agencies performing the testing shall be acceptable to Engineer prior to performing any work. Tests of concrete shall be made by a Concrete Field Testing Technician.

C. Testing Responsibilities of Contractor:

1. Submit data on qualifications of proposed testing agency for acceptance. Use of testing services will not relieve agency for acceptance. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

2. Duties and Responsibilities. Unless otherwise specified in the Contract Documents, the Contractor shall assume the following duties and responsibilities:

   a. Qualify proposed materials and establish mixture proportions.

   b. Furnish any necessary labor to assist Owner's testing agency in obtaining and handling samples at the project site or at the source of materials.

   c. Notify Owner's testing agency at least 24 hours in advance of operations to allow for completion of quality tests and for assignment of personnel.

   d. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens on the job site for initial curing as required by ASTM C31.

   e. Submit data and test documentation on materials and mixture proportions.

   f. Submit quality control program of the concrete supplier and provide copies of all test reports.

   g. When it is necessary to base concrete acceptance on accelerated strength testing, submit a request to use accelerated testing along with correlation data for the standard 28-day compressive strength based on at least 15 sets of test data in accordance with 1.07.E.2.d with concrete made with the same materials providing a range of at least f'_{cr} plus or minus 1000 psi.

D. Tests Required of Contractor's Testing Agency:

1. Unless otherwise specified in the Contract Documents, Contractor shall provide at no cost to Owner the necessary testing services for the following:

   a. Qualification of proposed materials and establishment of design mixtures.

   b. Other testing services needed or required by Contractor.

E. Testing Responsibilities of Owner's Testing Agency:

1. Unless otherwise specified in the Contract Documents, Owner's Testing Agency will provide the necessary services for the following:

   a. Representatives of Owner's testing agency will inspect, sample, and test materials and production of concrete required by the Engineer. When it appears that material furnished or work performed by Contractor fails to conform to Contract Documents, testing agency will immediately report such deficiency to the Engineer, Contractor, and concrete supplier.

   b. Testing agency and its representatives are not authorized to revoke, alter, relax, enlarge, or release any requirement of the Contract Documents, nor to accept any portion of the Work.

   c. Testing Agency shall report all test and inspection results to Engineer, Contractor, and concrete supplier within seven days after tests and inspections are performed.

2. Testing Services. Review and check-test proposed materials for compliance with Contract Documents.

   a. Review and check-test proposed design mixture as required by the Engineer.

   b. Obtain production samples of materials at plants or stockpiles during course of the Work and test for compliance with the Contract Documents.

   c. Obtain composite samples in accordance with ASTM C172. Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.

   d. Obtain at least one composite sample for each 50 cubic yards, or fraction thereof, of each design mixture of concrete placed in any one day. When the total quantity of concrete with a given design, mixture is less than 50 cubic yards, the strength tests may be waived by Engineer if in his judgement adequate evidence of satisfactory strength is provided.

   e. Conduct strength tests of concrete during construction in accordance with the following procedures:

      1) Mold and cure three cylinders from each sample in accordance with ASTM C31. Record any deviations from the ASTM requirements in the test report.

      2) Test cylinders in accordance with ASTM C39. Test one specimen at 7 days for information, and two specimens at 28 days for acceptance unless otherwise specified. The compressive strength test results for acceptance shall be the average of the compressive strengths from the two specimens tested at 28 days. If one specimen in a test shows evidence of improper sampling, molding, or testing,

discard the specimen and consider the strength of the remaining cylinder to be the test result. If both specimens in a test show any defects, discard the entire test.

3) When accelerated testing of concrete is permitted as an alternative to standard testing, mold and cure two specimens from each composite sample in accordance with ASTM C684. Make at least one accelerated strength test from each composite and one standard 28-day compressive strength test for at least every other accelerated strength test in accordance with ASTM C31. Use these test results to maintain and update the correlation between accelerated and standard 28-day compressive strength tests.

f. Determine slump of each composite sample test and whenever consistency of concrete appears to vary, using ASTM C143.

g. Determine temperature of each composite sample in accordance with ASTM C1064.

h. Test concrete required to be air-entrained for air content by ASTM C231, ASTM C173, or ASTM C138. Determine air content of normal weight concrete for each composite sample, or as directed by Engineer. Additional tests shall be performed as necessary for control.

i. Where concrete will be exposed to deicing salts or is so indicated on the Contract Documents, air content tests will be made on samples from the first three batches in the placement and until three consecutive batches have air contents within the range specified in Section 03 31 00 - Concrete Mixtures, paragraph 2.02D, Air Content, at which time every fifth batch will be tested. This test frequency will be maintained until a batch is not within the range specified, at which time testing of each batch will be resumed until three consecutive batches have air contents within the range specified. Additional tests may be performed as necessary for control. These air content tests may be taken on composite samples, or on samples from the batch at any time after discharge of 2 cubic feet of concrete.

3. Additional Testing Services When Required. Owner's testing agency will perform the following services when required by Engineer, at no cost to the Contractor:

a. Inspect concrete batching, mixing, and delivery operations.

b. Inspect forms, foundations preparation, reinforcing, embedded items, reinforcing placing, and concrete placing, finishing, and curing operations.

c. Sample concrete at point of placement and other locations as directed by Engineer and perform required tests.

d. Review manufacturer's report for each shipment of cement, reinforcing steel, and prestressing tendons, and conduct laboratory tests or spot checks of the materials received for compliance with specifications.

e. Other testing or inspection services as required by Engineer.

4. Other Testing Services As Needed. Owner's testing agency shall perform the following testing services when necessary, at the Contractor's expense.

a. Additional testing and inspection required because of changes in materials or mixture proportions requested by the Contractor.

b. Additional testing of materials or concrete occasioned by failure to meet specification requirements.

F. Tests On Hardened Concrete In Place:

1. General. Tests on hardened concrete will be performed by the Owner's testing agency when such tests are needed. Testing and core filling shall be at the Contractor's expense when tests are performed to verify the strength of the structure when required by this specification. Owner will pay costs if tests are at his request and not required by this specification.

2. Non-Destructive Tests. Use of the rebound hammer in accordance with ASTM C805, pulse velocity methods in accordance with ASTM C597, or other non-destructive devices may be permitted by the Engineer in evaluating the uniformity and relative concrete strength in place, or for selecting areas to be cored.

3. Core Tests.

a. Where required by the Engineer, cores shall be obtained and tested in accordance with ASTM C42. If concrete in the structure will be dry under service conditions, the cores shall be air-dried (temperature 60 to 80ºF, relative humidity less than 60 percent) for 7 days before testing and shall be tested dry. If concrete in the structure will be more than superficially wet under service conditions, the core shall be tested after moisture conditioning in accordance with ASTM C42.

b. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores as determined by the Engineer shall impair the strength of the structure as little as possible. If, before testing, cores show evidence of having been damaged subsequent to or during removal from the structure, replacement cores shall be taken.

c. Core holes shall be filled with low slump concrete or mortar of a strength equal to or greater than the original concrete.

G. Evaluation of Concrete Strength Tests:

1. Standard Molded and Cured Strength Specimens. Test results from standard molded and cured test cylinders shall be evaluated separately for each specified concrete design mixture. Evaluation will be valid only if tests have been conducted in accordance with procedures specified. For evaluation, each specified design mixture shall be represented by at least 5 tests.

2. Nondestructive Tests. Test results will be evaluated by the Engineer and will be valid only if tests have been conducted by properly calibrated equipment in accordance with recognized standard procedures.

3. Core Tests. Core tests will be evaluated by the Engineer and will be valid only if tests have been conducted in accordance with specified procedures.

H. Acceptance of Concrete Strength:

1. Standard Molded and Cured Strength Specimens. The strength level of concrete will be considered satisfactory when the averages of all sets of three consecutive compressive strength test results equal or exceed the specified compressive strength f_c' and no individual strength test result falls below the specified compressive strength f_c' by more than 500 psi. These criteria apply also when accelerated strength testing is specified unless another basis for acceptance is specified in the Contract Documents.

2. Nondestructive Tests. Nondestructive tests shall not be used as the sole basis for accepting or rejecting concrete but may be used when permitted to evaluate concrete where standard molded and cured cylinders have yielded results not meeting the criteria in 1.07.E.1.

3. Core Tests. Strength level of concrete in the area represented by core tests will be considered adequate when the average compressive strength of the cores are equal to at least 85 percent of specified compressive strength f_c', and if no single core is less than 75 percent of the specified compressive strength f_c'.

I. Field Acceptance of Concrete:

1. Air Content. Concrete not within the limits of air entrainment indicated in Section 03 31 00 and tested in accordance with 1.06.E.2.h shall not be used in the Work.

2. Slump. Concrete not within the slump limits of Section 03 31 00 at the point of placement shall not be used in the Work.

3. Temperature. Concrete not within temperature limits of Section 03 31 00 shall not be used in the Work.

1.07 ACCEPTANCE OF STRUCTURE

A. General: Completed concrete work shall conform to applicable requirements of this Specification and the Contract Documents.

1. Concrete work that fails to meet one or more requirements of the Contract Documents but subsequently is repaired to bring the concrete into compliance may be accepted.
2. Concrete work that fails to meet one or more requirements of the Contract Documents and cannot be brought into compliance will be rejected.
3. Repair rejected concrete work by removing and replacing or by reinforcing with additional construction required by the Engineer. To bring rejected work into compliance, use repair methods that will maintain specified strength and meet all applicable requirements for function, durability, dimensional tolerances, and appearance as determined by the Engineer.
4. Submit for acceptance the proposed repair methods, materials, and modifications needed to assure that concrete work will meet requirements of Contract Documents.
5. Contractor shall pay all costs to bring concrete work into compliance with requirements of the specification.
6. Concrete members cast in the wrong location will be rejected.

B. Dimensional Tolerances:

1. Formed surfaces resulting in concrete outlines smaller than permitted by the tolerances of ACI 117, may be considered deficient in strength and subject to the provisions of 1.07.D, Strength of Structure.
2. Formed surfaces resulting in concrete outlines larger than permitted by ACI 117 may be rejected. Excess materials will be subject to removal when required by the Engineer.
3. Inaccurately formed concrete surfaces that exceed ACI 117 tolerances may be rejected.
4. Finished slabs exceeding the tolerances in Section 03 30 00 - Cast-in-Place Concrete, may be corrected provided strength or appearance are not adversely affected.
5. Concrete with tolerances and defects exceeding the limitations of Section 03 10 00, Concrete Formwork, will be rejected.

C. Appearance:

1. Concrete exposed to view with defects that adversely affect the appearance of the specified finish will be rejected.
2. Concrete not exposed to view may be rejected for nonconforming appearance.

D. Strength of Structure:

1. Criteria for Determining Potential Strength Deficiency. Strength will be considered deficient and concrete will be rejected when the Work fails to comply with requirements which control the strength of the structure, including but not limited to the following conditions:

a. Concrete strength failing to comply with requirements of 1.06.H, Acceptance of Concrete Strength.

b. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the requirements of Section 03 20 00 - Concrete Reinforcement, or other Contract Document Requirements.

c. Concrete elements which differ from the required dimensions or location.

d. Curing not in accordance with Contract Documents.

e. Inadequate protection of concrete from extreme temperature and other environmental conditions during early stages of hardening and strength development.

f. Mechanical injury, construction fires, accidents, or premature removal of formwork resulting in deficient strength.

2. Action Required When Strength is Potentially Deficient. When strength of the structure is considered potentially deficient, the following actions may be required by Engineer:

a. Structural analysis or additional testing, or both.

b. Core tests.

c. If testing is inconclusive or impractical or if structural analysis does not confirm the safety of the structure, load tests may be required, and their results evaluated in accordance with ACI 318.

d. Concrete work rejected by structural analysis or by results of a load test shall be reinforced with additional construction when required by Engineer or replaced.

e. The Contractor shall document all repair work proposed to bring strength-deficient concrete work into compliance with Contract Documents and submit the documentation to Engineer for acceptance.

E. Durability:

1. Criteria for Determining Potential Durability Deficiency. Durability of concrete will be considered deficient and the concrete work will be rejected when it fails to comply with the requirements which control durability of the structure, including but not limited to the following conditions:

a. Strength failing to comply with 1.06.H, Acceptance of Concrete Strength.

b. Materials for concrete not conforming with the requirements in Section 03 31 00.

c. Concrete not conforming with the air entrainment requirements in Contract Documents or the total air content limits of Section 03 31 00.

d. Curing not in accordance with Contract Documents.

e. Inadequate protection of concrete from temperature and other environmental conditions during early stages of hardening and strength development.

2. Action Required When Durability is Potentially Deficient. When durability of the structure is considered to be deficient, the following actions will be taken by the Engineer:

a. Require that samples of the ingredient materials used in the concrete be obtained and tested.

b. Require that samples of hardened concrete be obtained from the structure by coring, sawing, or other acceptable means.

c. Require a laboratory evaluation of concrete and concrete materials to assess the ability of concrete to resist weathering action, chemical attack, abrasion, or other deterioration.

d. Concrete rejected for lack of durability shall be repaired or replaced as directed by Engineer.

e. The Contractor shall document repair work to bring concrete work into compliance with Contract Documents and submit the documentation to Engineer for acceptance.

1.08 PROTECTION OF IN-PLACE CONCRETE

A. Loading and Support of Concrete: Construction loads shall not exceed the superimposed load which the structural member, with necessary supplemental support, is capable of carrying safely and without damage.

B. Protection From Mechanical Injury: During the curing period, the Contractor shall protect concrete from damaging mechanical disturbances, including load stresses, shock, and harmful vibration. The Contractor shall protect concrete surfaces from damage by construction traffic, equipment, materials, rain or running water, and other adverse weather conditions.

1.09 PRECONCRETING CONFERENCE

A. A preconcreting conference shall be held 5 to 10 working days before placing concrete to discuss construction procedures, personnel, and equipment to be used. Those attending shall include:

1. CONTRACTOR

a. Project Manager, Superintendent, and all foremen responsible for placement of reinforcement and concrete and construction of forms, and finishing and curing of concrete, including subcontractors, as applicable.

b. Ready-mix supplier representative. (Optional if less than 25 cubic yards of concrete will be placed on the job.)

2. OWNER

a. Project Manager/Resident Project Representative.

b. Engineer.

c. Testing lab representative and field special inspection personnel.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

Not Used.

END OF SECTION 03 00 00

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SECTION 03 05 10
COLD WEATHER CONCRETING

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers requirements for cold weather concreting and protection of concrete from freezing during the specified protection period.

1.02 REFERENCES

A. ACI Standards:

1. ACI 301 Specifications for Structural Concrete

B. ASTM Standards:

1. C150 Standard Specification for Portland Cement
2. C494 Standard Specification for Chemical Admixtures for Concrete

1.03 DEFINITIONS

A. Cold Weather: A period when for more than three (3) successive days the average daily outdoor temperature drops below 40ºF. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50ºF occur during more than half of any 24-hour duration, the period shall no longer be regarded as cold weather.

B. Cold Weather Concreting: Operations concerning the placing, finishing, curing, and protection of concrete during cold weather.

C. Protection Period: The required time during which the concrete is maintained at or above a specific temperature in order to prevent freezing of concrete or to ensure the necessary strength development for structural safety.

D. Other definitions shall be as described in Section 03 00 00 - Concrete General Requirements.

1.04 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit four (4) copies of following Project Data:

1. The Contractor shall submit detailed, written procedures for the production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures. Do not begin cold weather concreting

until these procedures have been reviewed by the Owner's Resident Project Representative and the Engineer.

2. The details shall include, but not be limited to, the following:
   a. Procedures for protecting the subgrade from frost and the accumulation of ice or snow on reinforcement or forms prior to placement.
   b. Methods for temperature protection during placement.
   c. Types of covering, insulation, housing, or heating to be provided.
   d. Curing methods to be used during and following the protection period.
   e. Use of strength-accelerating admixtures.
   f. Methods of verification of in-place strength.
   g. Procedures for measuring and recording concrete temperatures.
   h. Procedures for preventing drying during dry, windy conditions.

PART 2 : MATERIALS

2.01 SCHEDULING PROTECTION MATERIALS

A. All materials and equipment required for protection shall be available at the project site before cold weather concreting.

2.02 CONCRETE

A. Concrete for slabs and other flatwork exposed to cycles of freezing and thawing in a wet condition during the construction period shall be air entrained as specified in ACI 301, even though the concrete may not be exposed to freezing in service.

PART 3 : EXECUTION

3.01 PREPARATION BEFORE CONCRETING

A. Remove all snow, ice, and frost from the surfaces, including reinforcement, against which the concrete is to be placed. Before beginning concrete placement, completely thaw the subgrade. Do not place concrete around embedded pipe penetrations identified in the Contract Documents unless such embedments are at a temperature above freezing.

3.02 CONCRETE TEMPERATURE

A. Placement Temperature: The minimum temperature of concrete immediately after placement shall be as specified in Column 2 of Table 3.02.A. The temperature of concrete as placed shall not exceed the values shown in Column 2 of Table 3.02.A by more than 20ºF.

Table 3.02.A: Concrete Temperature		
(1)	**(2)**	**(3)**
Least dimension of section, inches.	Minimum temperature of concrete as placed and maintained during the protection period, ºF.	Maximum gradual decrease in surface temperature during any 24-hour period after end of protection, ºF.
Less than 12	55	50
12 to less than 36	50	40
36 to 72	45	30
Greater than 72	40	20

B. Protection Temperature: Unless otherwise specified, the minimum temperature of concrete during the protection period shall be as shown in Column 2 of Table 3.02A. Temperatures specified to be maintained during the protection period shall be those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air. Measure the temperature of concrete in each placement not less than twice daily at regular time intervals, using a surface temperature measuring device having an accuracy of ± 2°F.

C. Termination of Protection: The maximum decrease in temperature measured at the surface of the concrete in a 24-hour period shall not exceed the values shown in Column 3 of Table 3.02.A. Do not exceed these limits until the surface temperature of the concrete is within 20ºF of the ambient or surrounding temperatures. When the surface temperature of the concrete is within 20ºF of the ambient or surrounding temperature, all protection may be removed.

3.03 CURING OF CONCRETE

A. Prevent concrete from drying during the required curing period. If water curing is used, terminate use at least 24 hours before any anticipated exposure of the concrete to freezing temperatures.

3.04 PROTECTION OF CONCRETE

A. Combustion Heaters: Vent flue gases from combustion heating units to the outside of the enclosure.

B. Overheating and Drying: Place and direct heaters and ducts to avoid areas of overheating or drying of the concrete surface.

C. Maximum Air Temperature: During the protection period, do not expose the concrete surface to air having a temperature more than 20ºF above the values shown in Column 2 of Table 3.02.A, unless higher values are required by an accepted curing method.

D. Protection Against Freezing: Cure and protect concrete against damage from freezing for a minimum period of 3 days, unless otherwise specified. Maintain the surface temperature of the concrete during that period in accordance with Column 2 of Table 3.02.A, unless otherwise specified. The protection period may be reduced to 2 days if use of one or more of the following to alter the concrete mixture is accepted:

1. Type III portland cement meeting the requirements of ASTM C150.
2. A strength-accelerating admixture meeting the requirements of ASTM C494.
3. 100 lb/yd3 of additional cement.

E. During periods not defined as cold weather, but when freezing temperatures may occur, protect concrete surfaces against freezing for the first 24 hours after placing.

F. Protection for Structural Safety: If the concrete strength is required for structural safety, extend the duration of the protection period to ensure the necessary strength development.

G. Protection Deficiency: If the temperature requirements during the specified protection period are not met but the concrete was prevented from freezing, continue protection until twice the deficiency of protection in degree-hours is made up. Deficient degree-hours may be determined by multiplying the average deficiency in temperature by the number of hours the temperature was below the values shown in Column 2 of Table 3.02.A.

END OF SECTION 03 05 10

SECTION 03 05 20
HOT WEATHER CONCRETING

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers requirements for placement of concrete during hot weather.

1.02 REFERENCES

A. ASTM Standards:

1.	C156	Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete
2.	C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

1.03 DEFINITION

A. Hot weather is defined as any combination of high ambient temperature, high concrete temperature, low relative humidity, wind velocity, and solar radiation, tending to impair the quality of fresh or hardened concrete, or otherwise resulting in detrimental concrete properties. During hot weather, any or all of the methods specified herein for temperature control of concrete shall be used as required to maintain the concrete temperature below the limits specified.

1.04 GENERAL PRACTICES AND MEASURES

A. The Contractor shall be responsible for practices and procedures to ensure that concrete quality is not adversely affected by hot weather. Practices and procedures and combinations thereof may include the following:

1. Retarding admixtures.
2. Cooling of aggregates and/or mix water.
3. Reduction in time of discharge and expedited placement.
4. Shading and/or cooling of the placement site.
5. Use of cements with reduced heat of hydration.
6. Reduction of cement content.
7. Placement at night.
8. Cooling coils in the element being constructed.
9. Use of ice as part of the mix water.

1.05 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit four (4) copies of the following Project Data:

1. The Contractor shall submit detailed, written procedures for the production, transportation, protection, curing, and temperature monitoring of concrete during hot weather. In the submittal, include procedures to be implemented upon abrupt changes in weather conditions or equipment failures. Do not begin hot weather concreting until these procedures have been reviewed by the Engineer and the Owner's Resident Project Representative.

2. Modifications in mix design shall require the approval of the Engineer. No embedding cooling devices may be placed in concrete elements without the approval of the Engineer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Aggregate piles, cement bins and batch plant bins shall be shaded from the direct rays of the sun, when possible.

B. Aggregate piles may be cooled by wetting and evaporation. Aggregate wetting shall be performed in such a manner that is accounted for in the total water added to the mix.

PART 2 : MATERIALS

2.01 CURING COMPOUNDS

A. Curing compounds, when their use is permitted for hot weather concreting, shall conform to ASTM C309, Type 2, except as follows: Water loss, when tested in accordance with ASTM C156, shall not exceed 0.39 kg/m2 in 72 hours.

PART 3 : CONSTRUCTION

3.01 CONCRETE TEMPERATURE

A. The temperature of concrete as delivered at the time and location of placement shall not exceed 100ºF under any conditions. The temperature of concrete as delivered at the time and location of placement under the following combined ambient conditions, except concrete that will be deposited within wall or column forms, shall not exceed the following temperatures:

Relative Humidity Less Than %	Ambient Temperature Greater than °F	Maximum Concrete Temperature °F
80	90	100
70	90	95
60	90	90
50	90	85
40	90	80
30	80	75
20	75	70

3.02 DELIVERY

A. Concrete shall be placed in the Construction within 45 minutes after the completion of mixing.

3.03 PREPARATION FOR PLACING

A. Elevated forms and reinforcing steel for beams and similar members shall be cooled by fog spraying and evaporation immediately prior to placing concrete. Forms shall be free of standing water when concrete is placed herein. Cooling water shall be disposed of in accordance with applicable local, state, and federal regulations.

3.04 PLACING

A. Concrete shall be placed in shallower layers than under normal weather conditions if necessary to assure coverage of the previous layer, while it will respond readily to vibration.

3.05 FINISHING

A. Fog spray shall be used during finishing operations whenever necessary to avoid surface plastic-shrinkage cracking. Fog spray shall also be used after finishing and before the specified curing is commenced to avoid surface plastic-shrinkage cracking.

3.06 PROTECTION AND CURING

A. Wet cure methods shall be used in accordance with Section 03 30 00 - Cast-In-Place Concrete. Forms shall be kept covered and continuously moist. Once forms are loosened, and during form removal, concrete surfaces shall be protected from drying and shall be kept continuously wet by fog spraying or other approved means.

B. Curing compounds may be used to augment wet cure methods, but shall not be used in lieu of a wet cure.

END OF SECTION 03 05 20

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SECTION 03 10 00
CONCRETE FORMWORK

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers design, construction, and treatment of formwork to confine and shape concrete to the required dimensions.

1.02 REFERENCES

A. ACI Standards:

1.	ACI 117	Specifications for Tolerances for Concrete Construction and Materials
2.	ACI 347	Guide to Formwork for Concrete

B. ASTM Standards:

1.	C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
2.	C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
3.	C803	Standard Test Method for Penetration Resistance of Hardened Concrete
4.	C873	Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds
5.	C900	Standard Test Method for Pullout Strength of Hardened Concrete
6.	C1074	Standard Practice for Estimating Concrete Strength by the Maturity Method

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Submit the following project data unless otherwise specified:

   a. Formwork Release Agent. Submit data on formwork release agent proposed for use with each form surface to be used for acceptance.

   b. Shop Drawings. Submit shop drawings for formwork and formwork supports.

2. Submit the following data when required:

   a. Reshoring. When reshoring is permitted or required, submit for acceptance the plan of reshoring procedures and operations in advance.

   b. Form Liners. Submit samples and catalog data for form liner material when specified.

3. Submit the following data when alternatives are proposed:

   a. Formwork Facing Materials. When formwork facing materials other than those specified are proposed for use, submit data for acceptance.

   b. Control Joints. If construction or control joints other than those indicated on Contract Drawings are desired, submit request for acceptance.

   c. Testing for Formwork Removal. When methods other than test of cylinders are proposed for determining time for formwork removal, submit data as specified in Paragraph 3.04.B.

1.04 DELIVERY, STORAGE, AND HANDLING

A. All materials and equipment shall be shipped, stored, handled, and installed in such a manner as not to degrade quality, serviceability, or appearance.

PART 2 : PRODUCTS

2.01 MATERIALS

A. Form Facing Materials: Materials for form faces in contact with concrete shall meet the requirements of Section 03 30 00 - Cast-In-Place Concrete, Paragraph 3.03.E, Unspecified Finishes, and the following requirements, unless otherwise specified in the Contract Documents.

   1. For Rough Form Finish. No form facing material is specified.

   2. For Smooth Form Finish. Form facing material shall be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper, or other acceptable material capable of producing the desired finish. Form facing material shall produce a smooth, uniform texture on concrete. Do not use form facing material with raised grain, torn surfaces, worn edges, patches, dents or other defects that will impair the texture of concrete surfaces. Furnish panels in largest practicable sizes to minimize number of joints.

B. Form Ties:

   1. General:

      a. Provide factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling concrete surfaces upon removal.

b. Provide ties so that portion remaining within concrete after removal of exterior parts is at least 1 inch from the outer concrete surface. Provide form ties which will not leave a hole larger than 1-inch diameter in the concrete surface.

c. Provide tie cones at each end.

d. Ties shall positively secure the wall to the required dimension and hold the wall to that dimension prior to and during concrete placement.

e. The use of tie wires as form ties will not be permitted.

2. Snap Ties:

a. Snap ties, if used, shall not be broken until the concrete has reached the design concrete strength. Snap ties, designed so that the ends must be broken off before the forms can be removed, shall not be used.

b. Ties for liquid containment structures and walls below grade shall have a neoprene waterstop, factory applied at the center of the tie.

3. Taper Ties:

a. Taper ties with plastic or rubber plugs of an approved and proven design may be used. The plugs shall be driven into the hole with a steel rod, placed in a cylindrical recess made therefore in the wall. At no time shall plugs be driven on the flat area outside the cylindrical recess. Plugs shall be A-58 Sure Plug as manufactured by Dayton Superior.

C. Formwork Release Agent: Use commercially manufactured form release agent that will prevent formwork absorption of moisture, prevent bond with concrete, not stain the concrete surfaces, and not leave residual matter on surface of concrete or adversely affect proper bonding or subsequent application of other material applied to concrete surface.

For concrete surfaces of reservoirs, tanks, or channels used for conveyance, treatment, or storage of water for eventual potable use, form release agents shall be listed in National Sanitation Foundation Standard 61, “Drinking Water System Components – Health Effects.”

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

A. Design and engineering of formwork and formwork supports shall be the responsibility of the Contractor. Designs of formwork and preparation of formwork drawings shall be under the supervision of a professional engineer registered in the state of Washington and shall conform to ACI 347.

B. Design formwork for construction loads, lateral pressure, and requirements of the applicable building code, and for construction sequence shown on the Contract Drawings, if applicable. Design formwork to withstand the pressure resulting from placement and vibration of concrete and to maintain specified tolerances. The design assumptions for form pressure and rate of fill limitations for wall forms shall be stated on the formwork drawings. Wall forms shall be designed so wall sections can be poured full height between joints shown on the Contract Drawings without horizontal cold joints.

C. Do not use earth cuts as forms for vertical or sloping surfaces unless required or permitted by Contract Documents.

D. Maximum deflection of facing materials reflected on concrete surfaces exposed to view shall be $^{1}/_{240}$ of the span between structural members of the formwork, except for architectural concrete.

E. Locate and detail formed joints to the following requirements:

1. Locate and form construction joints that least impair strength of the structure and meet the requirements of Section 03 30 00. In general, locate construction joints near the middle of spans of slabs, beams, and girders. When a beam intersects a girder at this point, the joint in the girder shall be offset a distance equal to or greater than twice the width of the beam. Locate joints in walls and columns at the underside of floors, slabs, beams, or girders and at the top of footings or floor slabs. Make joints perpendicular to the main reinforcement. Any construction joints not shown on the Contract Drawings shall require the approval of the Engineer.
2. Provide keyways where indicated on Contract Drawings. Where longitudinal keyways are indicated on the Contract Drawings, make them a minimum of 1½-inch deep in joints in walls and between walls and slabs or footings.
3. Provide control joints where indicated on the Contract Documents. The location of control joints other than those indicated on the Contract Documents shall be submitted for acceptance.

F. For smooth form finish, arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to a practical minimum. Support facing material with studs or other backing capable of preventing excessive deflection within the tolerances specified in Paragraph 2.02.D.

2.03 FABRICATION AND MANUFACTURE

A. Formwork shall be tight to prevent loss of mortar from concrete. Provide watertight formwork when architectural concrete is specified.

B. Place ¾-inch-minimum chamfer strips in the corners of formwork to produce beveled edges on permanently exposed surfaces and the edges of formed joints.

C. Provide temporary openings at the base of the column and wall formwork and at other points where necessary to facilitate cleaning and inspection. Clean and inspect immediately before concrete is placed.

D. Fabricate embedded form ties so ends or end fasteners can be removed with minimum spalling at the faces of concrete.

After the ends or end fasteners of form ties have been removed, terminate the embedded portion of ties not less than 2 diameters, or twice the minimum cross-section dimension of the tie, from the formed concrete surface. In no case shall this distance be less than ¾ inch. Repair tie holes in accordance with Section 03 30 00.

E. Locate waterstops in joints where indicated on Contract Drawings. Use pieces of premolded waterstop with a maximum practicable length to hold the number of end joints to a minimum.

PART 3 : EXECUTION

3.01 CONSTRUCTION AND ERECTION OF FORMWORK

A. At construction joints, lap contact surface of the form sheathing for flush surfaces exposed to view over the hardened concrete in the previous placement by not more than 1 inch.

Ensure formwork is held firmly against hardened concrete to prevent offsets or loss of mortar at construction joints and to maintain a true surface.

B. Unless otherwise specified in Contract Documents, construct formwork so concrete surfaces will conform to tolerance limits of ACI 117. The class of surface as given in ACI 117 shall be as follows:

1. Walls and elevated slabs: Class A
2. Footings: Class C

C. Provide positive means of adjustment (wedges or jacks) of shores and struts. Do not make adjustments in the formwork after concrete has taken its initial set. Brace formwork securely against lateral deflection.

D. To maintain specified tolerances, camber formwork to compensate for anticipated deflections in formwork prior to hardening of concrete. Set formwork and intermediate screed strips for slabs accurately to produce designated elevations and contours of the finished surface prior to removal of formwork. Ensure that edge forms and screed strips are sufficiently strong to support vibrating screeds or roller pipe screeds when the finish specified requires the use of such equipment.

E. When formwork is cambered, set screeds to a like camber to maintain required concrete thickness.

F. Fasten form wedges in place after final adjustment of forms and prior to concrete placement.

G. Anchor formwork to shores, supporting surfaces, or members to prevent upward or lateral movement of the formwork system during concrete placement.

H. The Contractor shall form for and leave all openings in the concrete work where required for the installation of his own work and/or for the work of others. He shall carefully examine all drawings for the need of such openings, and in failing to provide openings as shown on the drawings, he shall cut them at his own expense. Except as otherwise noted or specified, all such openings shall be filled with concrete, after the work to be installed therein has been completed.

I. Provide runways for moving equipment and support runways directly on the formwork or structural member without resting on the reinforcing steel.

J. Place sleeves, inserts, anchors, and embedded items required for adjoining work or for support of adjoining work prior to concrete placement.

K. Position and support expansion joint material, waterstops, and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent entry of concrete into voids.

L. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign material before concrete is placed.

M. Cover surfaces of formwork with acceptable formwork release agent. Apply form release agent before placing reinforcing steel and concrete. A field-applied formwork release agent or sealer of an acceptable type or an acceptable factory-applied, non-absorptive liner may be used. Do not allow formwork release agent to puddle in the forms. Do not allow formwork release agent to contact reinforcing steel or hardened concrete against which fresh concrete is to be placed.

N. Cleanouts and Access Panels:

1. Temporary openings shall be provided at the bottom of the wall forms to facilitate cleaning and inspection prior to placing concrete.

2. Shavings, chips, and all refuse shall be removed, and the forms shall be broom-cleaned before any concrete is placed. Cleanout openings will not be permitted in exposed concrete without the Engineer's approval.

3.02 REMOVAL OF FORMWORK

A. When finishing is required, remove formwork as soon as removal operations will not damage concrete, subject to Paragraph 3.04, Strength of Concrete Required for Removal of Formwork.

B. Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform needed repairs or treatment required at once and follow immediately with specified curing.

C. Loosen formwork for wall openings when this can be accomplished without causing damage to concrete.

D. Do not allow removal of formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete to damage the concrete. Perform needed repair and treatment required on vertical surfaces at once and follow immediately with specified curing.

E. Leave formwork and shoring in place to support the weight of concrete in beams, slabs, and in place structural members until concrete has reached the specified compressive strength f_C' in accordance with Paragraph 3.04, Strength of Concrete for Removal of Formwork. Formwork and shoring may be removed at a lower compressive strength when otherwise specified or permitted in Contract Documents. When shores and other vertical supports are arranged so the form facing material may be removed without loosening or disturbing the shores and supports, facing material may be removed at an earlier age.

F. Form Removal Safety:

1. Forms shall be removed in a manner to ensure complete safety of the structure. In no case shall supporting forms or shoring of slabs or other suspended members be removed until members have acquired sufficient strength to support safely their weight and the load thereon.
2. Care shall be taken by the Contractor to assure that newly unsupported portions of the structure are not subjected to heavy construction or material loading. Additional shores or bracing shall be provided, as required to adequately support the members during the construction period.
3. All responsibility involved in the removal of forms, shores, and bracing shall rest with the Contractor, and he shall be solely responsible for accidents to persons and property of any nature.

G. All parts of removed forms, reserved for reuse shall be inspected, cleaned and repair. Any part or panel which has been dented, deformed, or otherwise rendered unfit for reuse shall be discarded.

H. Tie-rod clamps to be entirely removed from the wall shall be loosened 24 hours after concrete is placed, and form ties may be removed at that time.

3.03 RESHORING

A. When reshoring is permitted or required, submit for acceptance a plan of reshoring procedures and operations prior to their use.

B. While reshoring is underway, do not permit any construction load on new construction.

C. During reshoring, do not allow concrete in beam, slab, column, or any structural member to be loaded with combined dead and construction loads in excess of the loads permitted by Engineer for the concrete compressive strength at the time of reshoring.

D. Place reshores in sequence with stripping operations.

E. Tighten reshores to carry the required loads without overstressing the concrete members. Leave reshores in place until tests required by Paragraph 3.04, Strength of Concrete Required for Removal of Formwork, indicate that the concrete compressive strength has attained the minimum value specified in Paragraph 3.02.E.

F. For floors supporting shores under newly placed concrete, leave in place the original supporting shores or reshore. The shoring or reshoring system shall have a capacity sufficient to resist the anticipated loads. Reshores shall be located directly under a shore position.

G. In multi-story buildings, extend reshoring over a sufficient number of stories to distribute the weight of newly placed concrete, forms, and construction live loads.

3.04 STRENGTH OF CONCRETE REQUIRED FOR REMOVAL OF FORMWORK

A. When removal of formwork or reshoring is based on concrete reaching a specified compressive strength, concrete will be presumed to have reached this strength when either of the following requirements has been met:

1. Test cylinders, field cured along with the concrete they represent, have reached the compressive strength specified for removal of formwork or reshoring. Mold cylinders in accordance with ASTM C31, and cure them under the same conditions for moisture and temperature as used for the concrete they represent. Test cylinders in accordance with ASTM C39.
2. Concrete has been cured in accordance with the specified provisions for the same length of time as laboratory-cured cylinders which have reached the specified strength. Determine the length of time concrete has been cured in the structure by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50ºF, and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.

   Alternatively, when specified, the strength of the concrete may be determined by the methods in Paragraph 3.04.B.

B. Alternatively, when specified, use of the following methods for evaluating concrete strength for formwork removal is permitted. Prior to using methods in Paragraphs 3.04.B.1 through 3.04.B.4, submit sufficient data using job materials to demonstrate correlation of measurements on the structure with the compressive strength of laboratory-cured molded cylinders or drilled cores. Correlation data for each alternative method for determining strength shall be submitted for acceptance.

1. Tests of cast-in-place cylinders in accordance with ASTM C873. This is limited to slabs with concrete depth from 5 to 12 inches.
2. Penetration resistance in accordance with ASTM C803.
3. Pullout strength in accordance with ASTM C900.
4. Acceptable maturity factor procedure in accordance with ASTM C1074.

C. Minimum Stripping Time: Form removal for elevated slabs and beam or girder soffits shall be based on Paragraph A or B, above, with required concrete compressive strength equal to the specified 28-day compressive strength, but in no case less than 7 days.

Form removal for columns, walls, and side forms of beams, girders, or footings shall be not less than 12 hours.

3.05 FIELD QUALITY CONTROL

A. Establish and maintain controls and benchmarks in an undisturbed condition until final completion and acceptance of the project.

B. Variations from plumb and designated building lines shall not exceed the tolerances specified in ACI 117.

3.06 INSTALLATION OF EMBEDDED ITEMS

A. General:

1. The Contractor shall notify all trades when construction is ready for the setting of anchor bolts, inserts, sleeves, and other built-in equipment, in order that such material shall be set at the proper time. Before placing concrete, care shall be taken to determine that all items to be embedded in concrete are accurately located, firmly secured in place and protected from damage or displacement until securely held by the concrete.
2. All items shall be thoroughly cleaned, free from rust, scale, dirt, grease or other coating. Any wood used for removable keys shall be thoroughly dampened before concrete is placed against the wood. The Contractor shall be responsible for any displacement of the items caused by his workers.

B. Electrical conduit may be embedded in concrete, provided the following conditions are met. Conduit runs which cannot satisfy these conditions shall be done at the Contractor's expense.

1. Outside diameter of conduit shall not exceed $^1/_3$ of the concrete thickness.
2. Conduit shall not be placed closer than 3 diameters on center.
3. Conduit shall not be embedded in structural concrete slabs less than 4 inches thick.
4. Only 2 conduits may cross at any point. The sum of the outside diameter of the crossing conduits shall not exceed $^1/_3$ of the concrete thickness.
5. A 1½-inch-minimum concrete cover shall be provided for conduits in structural concrete slabs.
6. Conduit shall not be located between bottom of reinforcing steel and bottom of concrete slab.
7. Conduit is generally not permitted in beams or girders.
8. Aluminum conduit shall not be embedded in concrete.

9. Reinforcing steel and/or post-tensioning ducts shall not be repositioned to clear conduit. Adjust conduit positions to clear reinforcement.

END OF SECTION 03 10 00

SECTION 03 15 00
CONCRETE ACCESSORIES GENERAL

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers concrete anchors and miscellaneous embedded items.

1.02 REFERENCES

A. ASTM Standards:

1.	A307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength
2.	C881/C881M	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
3.	D1751	Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
4.	F3125	Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Catalog data for all items covered by this Section to be incorporated in the Work.

PART 2 : MATERIALS

2.01 ANCHOR BOLTS

A. Anchor bolts shall be either drilled anchors or cast-in-place as shown on the Plans.

1. Drilled anchors shall either be epoxy adhesive type or expansion type, torque-controlled, 316 stainless steel, Hilti, Rawl, Covert or approved equal. Hole diameter shall be in accordance with manufacturer's instructions. Epoxy for adhesive anchors or dowel embedments shall be a non-sag, two-component epoxy resin conforming to ASTM C881, Type I, IV, or V; Grade 3, Class D, E, or F as required for application between concrete temperatures of 40 and 90 °F.

2. All anchors shall be male-type projecting anchors, unless female-type anchors are specifically called out otherwise. Provide minimum embedment depths shown on the Contract Drawings, but in no case less than UBC minimums for the size called out. Connected work shall not bear on threads.

3. Cast-in-place anchor bolts shall be ASTM A307 or ASTM F3125, unless otherwise indicated on the Drawings.

2.02 DOVETAIL SLOTS

A. Dovetail slots for masonry anchorage shall be galvanized steel, 22-gauge with removable filler, 1-inch face by 1-inch-deep x 1 inch thick. Heckman or approved equal.

2.03 REGLETS

A. Reglets shall be as manufactured by Progress Unlimited, Inc., Heckman, or equal. Reglet shall be of rigid PVC plastic and accurately placed and free from grout to assure an acceptable channel to receive gasket.

2.04 FORM LINER

A. Form liner shall be reusable fiberglass type, Greenstreak, Burke or approved equal, in the pattern indicated on the Contract Drawings.

2.05 PREFORMED JOINT FILLER

A. Preformed joint filler shall be asphalt-impregnated expansion filler conforming to ASTM D1751.

2.06 BACKER ROD

A. Backer rod for joint sealant shall be closed-cell polyethylene foam, circular profile, furnished in sizes greater in diameter than the joint thickness.

2.07 JOINT SEALANT

A. Potable Water Exposures: One-component, polyurethane-base, non-sag elastomeric sealant, Sikaflex-1A as manufactured by Sika Corporation or equal. Joint sealant shall be NSF-approved for potable water contact.

B. All Other Exposures: Two-part polyurethane sealant, Daraseal U Non-Sag by A.C. Horn, Inc., Sikaflex-2C by Sika Corporation or equal. A primer shall be applied to the concrete prior to the sealant application. Backer rod shall be used.

PART 3 : EXECUTION

3.01 ANCHOR BOLTS

A. All drilled anchors shall be tensioned using torque wrenches to not less than 50%, nor more than 90% of rated allowable capacity after installation, in accordance with Manufacturer's instructions.

B. All cast-in-place anchors shall be tensioned to not less than 10,000 psi, nor more than 20,000 psi tensile stress based on the root area of the thread.

END OF SECTION 03 15 00

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SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers materials, fabrication, placement and tolerances of reinforcement and reinforcement accessories.

1.02 REFERENCES

A. ASTM Standards

1.	A184/A184M	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
2.	A615/A615M	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3.	A706/A706M	Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
4.	A767/A767M	Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
5.	A775/A775M	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
6.	A780/A780M	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
7.	A884/A884M	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
8.	A996/A996M	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
9.	A1064/A1064M	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

B. American Welding Society (AWS)

1. AWS D-1.4 Structural Welding Code-Reinforcing Steel

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Submit the following project data unless otherwise specified:

a. Placing Drawings. Submit placing drawings showing fabrication dimensions and locations for placement of reinforcement and reinforcement supports.

b. Splices. Submit a list and request to use splices not indicated in Contract Documents.

c. Mechanical Connections. Submit request for the use of mechanical connections not shown on the Project Drawings.

d. Column Dowels. Submit requests for placement of column dowels without the use of templates.

e. Field Bending. Submit requests and procedures to field bend or straighten reinforcement partially embedded in concrete.

2. Submit the following data when required:

a. Welding. Submit description of reinforcement weld locations and welding procedures, when welding is permitted in accordance with 2.02.B, Welding.

b. Supports. If coated reinforcement is required, submit description of reinforcement supports not described in 3.02.D, Reinforcement Supports, and material for fastening coated reinforcement.

3. Submit the following data when alternatives are proposed:

a. Reinforcement Relocation. Submit request to relocate any reinforcement that exceeds placement tolerances.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Prevent bending, coating with earth, oil, or other material, or otherwise damaging the reinforcement.

B. For handling coated reinforcement, use equipment having contact areas padded to avoid damaging the coating. Lift bundles of coated reinforcement at multiple pick-up points to prevent bar-to-bar abrasion from sags in the bundles. Do not drop or drag coated reinforcement. Store coated reinforcement on cribbing that will not damage the coating.

PART 2 : PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars: Bars used as reinforcement shall be deformed except spirals and welded wire fabric, which may be plain unless otherwise designated on the Contract Drawings. Reinforcement shall be grade 60 unless otherwise indicated on the Contract Drawings and shall conform to one of the following:

1. ASTM A615
2. ASTM A996
3. ASTM A706

B. Coated Reinforcing: Reinforcing bar coatings, when required, shall be zinc or epoxy, as indicated on the Contract Drawings.

1. Zinc-coated (galvanized) reinforcement shall conform to ASTM A767. Supplementary requirements S1 and S2 shall apply when fabrication after galvanization includes cutting and bending. Supplementary requirement S2 shall apply when fabrication after galvanization includes only bending.

   Repair all coating damage due to shipping, handling, and placing in accordance with ASTM A780. The maximum amount of repaired damaged areas shall not exceed 2 percent of the surface area in each linear foot of each bar.

2. Epoxy-coated reinforcement shall conform to ASTM A775. Repair damaged areas with patching material conforming to ASTM A775 and in accordance with the material manufacturer's recommendations. Repair all coating damage due to shipping, handling, and placing. The maximum amount of repaired damaged areas shall not exceed 2 percent of the surface area in each linear foot of each bar. Fading of the coating color will not be cause for rejection of epoxy-coated reinforcing bars.

C. Bar Mats: Use bar mats of the clipped type conforming to ASTM A184 assembled from one of the following combinations:

1. Bars conforming to ASTM A615, ASTM A996, or ASTM A706.
2. Zinc-coated (galvanized) bars conforming to ASTM A767 and zinc-coated (galvanized) or non-metallic clips with any damage to coatings repaired in accordance with 2.01.B.1.
3. Epoxy-coated bars conforming to ASTM A775 and epoxy-coated or non-metallic clips with any damage coatings repaired in accordance with 2.01.B.2.

D. Wire: Use plain or deformed wire as indicated on the Contract Drawings. Plain wire may be used for spirals.

1. Plain wire shall conform to ASTM A1064.
2. Deformed wire size D4 and larger shall conform to ASTM A1064.
3. Epoxy-coated wire shall conform to ASTM A884.
4. For wire with a specified yield strength f_y exceeding 60,000 psi, f_y shall correspond to a strain of 0.35 percent.

E. Welded Wire Fabric:

1. Plain Wire Fabric. ASTM A1064, with welded intersections spaced not farther apart than 12 inches in the direction of principal reinforcement.
2. Deformed Wire Fabric. ASTM A1064, with welded intersections spaced not farther than 16 inches in the direction of principal reinforcement.
3. Epoxy-coated welded wire fabric shall conform to ASTM A884.

4. For welded wire fabric with a specified yield strength f_y exceeding 60,000 psi, f_y shall correspond to a strain of 0.35 percent.

F. Wire Reinforcement Supports: Unless otherwise specified or permitted, use wire reinforcement supports complying with Class 1, maximum protection, or Class 2, moderate protection as indicated in the CRSI *Manual of Standard Practice,* Chapter 3, Bar Supports.

G. Coated Wire Reinforcement Supports:

1. For Epoxy-Coated Reinforcement. Use wire reinforcement supports coated with dielectric material, including epoxy or other polymer, for a minimum distance of 2 inches from the point of contact with epoxy-coated reinforcement.

2. For Zinc-Coated Reinforcement. Use galvanized wire reinforcement supports or wire reinforcement supports coated with dielectric material.

H. Precast Concrete Reinforcement Supports: Precast concrete supports for supporting reinforcement shall not be less than 4 square inches having a compressive strength equal to or greater than the specified compressive strength of the concrete being placed.

I. All-Plastic Bar Supports: All-plastic bar supports may be used for horizontal and vertical reinforcing steel. They may have a snap-on action or other method of attachment. All-plastic supports shall be non-porous and chemically inert in concrete. All-plastic bar supports shall have rounded seatings so as not to punch holes in the formwork and shall not deform under load when subjected to normal temperatures encountered in use, nor shall they shatter or severely crack under impact loadings when used in cold weather.

J. All-plastic bar supports shall have at least 25% of their gross plane area perforated, and shall not be placed closer than 12 inches apart along a bar.

K. Tie Wire: No. 16 American Wire Gauge or heavier, black annealed per ASTM A1064.

2.02 FABRICATION

A. Reinforcement: Bend all reinforcement cold unless heating is specifically authorized in the Contract Documents or by the Engineer. Fabricate reinforcement in accordance with fabricating tolerances of ACI 117.

B. Welding:

1. When welding of reinforcement is required or permitted, make all welds in conformance with AWS D1.4. Do not weld crossing bars (tack welding) for assembly of reinforcement, supports, or embedded items.

2. After completing welds on zinc-coated (galvanized) or epoxy-coated reinforcement, repair coating damage in accordance with requirements in 2.01.B.1 or 2.01.B.2, respectively. Coat welds and steel splice members used to splice reinforcement with the same material used for repair of coating damage.

PART 3 : EXECUTION

3.01 PREPARATION

A. When concrete is placed, all reinforcement shall be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory, provided the minimum nominal dimensions, nominal weight and the minimum average height of deformations of a hand-wire-brushed test specimen are not less than the applicable ASTM specification requirements.

3.02 PLACEMENT

A. Tolerances: Place, support, and fasten reinforcement as shown on the Contract Drawings. Do not exceed the placing tolerances specified in ACI 117 before concrete is placed. Placing tolerances shall not reduce cover requirements except as specified in ACI 117.

B. Reinforcement Relocation: When necessary to move reinforcement beyond the specified placing tolerances to avoid interference with other reinforcement, conduits, or embedded items, submit the resulting arrangement of reinforcement for acceptance.

C. Concrete Cover: Minimum concrete cover for reinforcement, unless otherwise indicated in the Contract Drawings, shall be as indicated below:

	Minimum Cover (inches)
Slabs & Joists	
Top & bottom bars for dry conditions	
#11 bars and smaller	¾
#14 and #18 bars	1½
Formed concrete surfaces exposed to earth, water, or weather, and over or in contact with sewage and for bottoms bearing on work mat, or slabs supporting earth cover.	
#5 bars and smaller	1½
#6 through #18 bars	2
Beams & Columns, formed	
For dry conditions	
Stirrups, spirals, and ties	1½
Principal reinforcement	2
Exposed to earth, water, sewage, or weather	
Stirrups, spirals, and ties	2
Principal reinforcement	1½
Walls	
For dry conditions	
#11 bars and smaller	¾
#14 and #18 bars	1½
Formed concrete surfaces exposed to earth, water, sewage, weather, or in contact with ground	2
Footings and Base Slabs	
At formed surfaces and bottoms bearing on concrete work mat	2
At unformed surfaces and bottoms in contact with earth	3
Top of footings	same as slabs
Over top of piles	2

For bundled bars, minimum concrete cover shall be equal to the equivalent diameter of the bundle but need not be greater than 2 inches, except the minimum cover shall not be less than specified above. The equivalent diameter of the bundle shall be based on a single bar of a diameter derived from the equivalent total area.

Tolerances on minimum concrete cover shall meet the requirements of ACI 117.

D. Reinforcement Supports: Size and spacing of reinforcement supports shall conform to the CRSI Manual of Standard Practice. Reinforcement shown on the Contract Drawings shall not be relocated to serve as bolsters for other bars. The Contractor shall provide additional bars if necessary to support the reinforcement shown on the Contract Drawings.

Horizontal bars in slabs and beams shall be supported at intervals not greater than 48 inches.

Wall and column reinforcement shall be laterally supported by side form spacers or other means at intervals not greater than 48 inches horizontally or vertically in the case of walls, and not greater than 48 inches vertically and at not less than 90-degree intervals in the case of columns.

Unless otherwise approved by the Engineer, use the following reinforcement supports:

1. Place reinforcement supported from the ground or mud on precast concrete reinforcement supports.
2. Place non-coated reinforcement supported from formwork on reinforcement supports made of concrete, metal, or plastic.
3. Place zinc-coated (galvanized) reinforcement supported from formwork on wire reinforcement supports, which are galvanized, coated with dielectric material, or made of dielectric material.
4. Reinforcement and embedded steel items used with zinc-coated (galvanized) reinforcement shall be zinc-coated (galvanized) or coated with non-metal materials.
5. Place epoxy-coated reinforcement supported from formwork on coated wire reinforcement supports, or on reinforcement supports made of dielectric material. Coatings or materials shall be compatible with concrete.
6. When precast reinforcement supports with embedded tie wires or dowels are used with epoxy-coated reinforcement, wires, or dowels shall be coated with dielectric material.
7. Reinforcement used as supports with epoxy-coated reinforcement shall be epoxy-coated.
8. In walls reinforced with epoxy-coated reinforcement, spreader bars shall be epoxy-coated. Proprietary combination bar clips and spreaders used in walls with epoxy-coated reinforcement shall be made of corrosion-resistant material or coated with dielectric material.
9. Fasten epoxy-coated reinforcement with tie wires coated with epoxy or other polymer.

E. Welded Wire Fabric: For slabs on grade, extend welded wire fabric to within 2 inches of the concrete edge. Lap edges and ends of fabric sheets a minimum of one-mesh spacing. Welded wire fabric may extend through contraction joints only where permitted. Support welded wire fabric during placing of concrete to assure required positioning in the slab. Do not place welded wire fabric on grade and subsequently raise into position in concrete.

F. Column Dowels: Furnish and use templates for placement of column dowels unless otherwise permitted.

G. Make splices as indicated on the Contract Drawings unless otherwise approved by the Engineer. Mechanical connections for reinforcement not shown on the Contract Drawings may be used when approved by the Engineer. Reinforcement coating shall be removed in the area of the mechanical connection if so, required by the connection manufacturer. After installing mechanical connections on zinc-coated (galvanized) or epoxy-coated reinforcement, repair coating damage and areas of removed coating in accordance with 2.01.B.1 and 2.01.B.2. Coat exposed parts of mechanical connections used on coated bars with the same material used for repair of coating damage.

H. Field Bending or Straightening: When permitted, bend or straighten reinforcement partially embedded in concrete in accordance with the following procedures.

Reinforcing bar sizes No. 3 through No. 5 may be bent cold the first time provided reinforcing bar temperature is above 32ºF. For other bar sizes, preheat reinforcing bars before bending.

1. Preheating. Apply heat by any method which does not harm the reinforcing bar material or cause damage to the concrete. Preheat a length of reinforcing bar equal to at least 5 bar diameters in each direction from the center of the bend, but do not extend preheating below the surface of the concrete. Do not allow the temperature of the reinforcing bar at the concrete interface to exceed 500ºF.

   The preheat temperature of the reinforcing bar shall be 1,100 to 1,200ºF.

   Maintain the preheat temperature until bending or straightening is complete.

   Measure the preheat temperature by temperature measurement crayons, contact pryometer, or other acceptable method.

   Do not artificially cool heated reinforcing bars until the temperature of the bar is less than 600ºF.

2. Bend Diameters. Minimum inside bend diameters shall conform to the requirements of the table below unless otherwise permitted. In addition, beginning of the bend shall not be closer to the concrete surface than the minimum diameter of bend.

Bar Size	Minimum Inside Bend Diameter
#3 through #8	6 bar diameters
#9, #10 and #11	8 bar diameters
#14 and #18	10 bar diameters

3. Repair of Bar Coatings. After field bending or straightening zinc-coated (galvanized) or epoxy-coated reinforcing bars, repair coating damage with 2.01.B.1 or 2.01.B.2.

I. Field Cutting of Reinforcement: Reinforcement shall not be cut in the field except when specifically permitted.

1. When zinc-coated (galvanized) reinforcing bars are cut in the field, coat the ends of the bars with a zinc-rich formulation used in accordance with the manufacturer's recommendations, and repair any coating damage in accordance with 2.01.B.1.

2. When epoxy-coated reinforcing bars are cut in the field, coat the ends of the bars with the same material used for repair of coating damage, and repair any coating damage in accordance with 2.01.B.2.

J. Reinforcement Through Expansion Joint: Do not continue reinforcement or other embedded metal items bonded to concrete through expansion joints. Dowels bonded on only one side of a joint and waterstops may extend through the joint.

K. Worker Safety: Workers placing reinforcing steel shall wear safety equipment and harnesses as required by state occupational safety regulations.

END OF SECTION 03 20 00

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers the production of cast-in-place structural concrete. Included are methods and procedures for obtaining quality concrete through proper handling, placing, finishing, curing, and repair of surface defects.

1.02 REFERENCES

A. ACI Standards:

1. ACI 117

B. ASTM Standards:

1.	C39/C39M	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
2.	C171	Standard Specification for Sheet Materials for Curing Concrete
3.	C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
4.	C881/C881M	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
5.	C928/C928M	Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs
6.	C1059/C1059M	Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete
7.	C1107/C1107M	Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Nonshrink)

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Submit the following data unless otherwise specified:

a. Field Control Test Reports. Maintain and submit accurate records of all test and inspection reports.

b. Conveying Equipment. Submit description of conveying equipment.

c. Temperature Measurement. Submit proposed method of measuring concrete surface temperature changes.

d. Repair Methods. When stains, rust, efflorescence, and surface deposits must be removed as described in 3.07.G, submit the proposed method of removal.

e. Placement Notification. Submit notification at least 24 hours in advance of concrete placement.

f. Replacement Requirements. Submit requests for acceptance of reinforcement and form placement at least 48 hours in advance of concrete placement.

g. Wet Weather Placement. When placement is scheduled during wet weather, submit request for acceptance of protection.

h. Hot or Cold Weather Placement. When placement of concrete is subject to the requirements of Section 03 05 10 - Cold Weather Concreting or Section 03 05 20 - Hot Weather Concreting, submit request for placement along with the submittals required by those sections.

2. Submit the following data when required:

a. Matching Sample Finish. When special finishes are required by Contract Documents, submit sample finish described in 3.03.B.

b. Exposed Aggregate Surface. When an exposed aggregate surface is specified and a chemical retarder is proposed to be used, submit specification and data on the retarder and proposed method of use of retarder.

3. Submit the following data when alternatives are proposed:

a. Construction Joints. Submit information for acceptance of proposed location and treatment of construction joints proposed but not indicated on the Contract Drawings. The determination of acceptability of proposed construction joints shall be made solely by the Engineer.

b. Two-Course Slabs. When a bonding agent other than cement grout is proposed, submit specification and data of bonding agent.

c. Underwater Placement. When underwater placement is planned, submit request for acceptance of proposed method.

d. Saw Cut Joints. When sawcut joints other than those indicated on the Contract Drawings are proposed, submit request of the proposed method.

e. Moisture-Preserving Method. When a moisture-preserving method other than specified in 3.06.C is proposed, submit request of the proposed method.

f. Coated Ties. When coated form ties described in 3.07.B are proposed to preclude the requirement to patch tie holes, submit proposed coated tie description.

g. Repair Material. When repair material described in 2.01.C, Proprietary Patching Materials, is proposed, submit the repair material specification, data on the proposed patching material, and proposed preparation and application procedure.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Place concrete within the time limits required in Section 03 31 00 - Concrete Mixtures.

B. Storage and Handling: Store and handle products to retain original quality. Do not use products stored beyond the manufacturer's recommended shelf life.

PART 2 : PRODUCTS

2.01 MATERIALS

A. Curing Compounds: Where the use of curing compounds is approved by the Engineer, use curing compounds that conform to ASTM C309. Curing compound shall be translucent with fugitive dye. Combination curing compound/sealer products shall not be used unless sealer is part of the specified finish.

Where concrete is to be coated with moisture- or waterproofing compound or sealer, curing compounds shall not be used unless certified by the manufacturer as not adversely affecting the bond or performance of subsequently applied coatings, or shall be removed after completion of the cure using light water blast in accordance with manufacturer's recommendations.

B. Sheet Materials For Curing Concrete: Use sheeting materials that conform to ASTM C171.

C. Proprietary Patching Materials: Use acceptable proprietary patching materials complying with 3.07.F, Repair Materials Other Than Site-Mixed Portland Cement Mortar.

D. Bonding Grout: Use bonding grout in accordance with 3.07.D, Preparation of Bonding Grout.

E. Site-Mixed Portland Cement Repair Mortar: Use repair mortar in accordance with 3.07.E, Site-Mixed Portland Cement Repair Mortar.

F. Floor Hardener: Floor hardener shall be a graded, iron aggregate base compound for dry-shake application and trowel embedment into fresh concrete. The compound shall be packaged in 90-lb, poly-lined bags and shall contain a dispersing agent, Portland cement and a stable lime-proof pigmentation to color the application gray. Wet cure or use curing compound recommended by the hardener manufacturer.

G. Floor Sealer:

1. Colorless low VOC water-based solution containing acrylic copolymers:
    a. ASTM C1315, Class B, minimum 30 percent solids.
2. L&M Construction Chemicals Inc., Dress & Seal WB 30 or equivalent.

PART 3 : EXECUTION

3.01 PREPARATION

A. Do not place concrete until data on materials and mixture proportions are accepted.

B. Remove hardened concrete and foreign material from the inner surfaces of conveying equipment.

C. Before placing concrete in forms, complete the following:

1. Comply with formwork requirements specified in Section 03 10 00 - Concrete Formwork.
2. Remove snow, ice, frost, water, and other foreign material from surfaces, including reinforcement and embedded items, against which concrete will be placed.
3. Comply with reinforcing steel placement requirements in Section 03 20 00 - Concrete Reinforcement.
4. Position and secure in place expansion joint material, anchors, and other embedded items.
5. Obtain acceptance of finished preparation by Engineer or Owner's inspector.

D. Before placing a concrete slab on grade, clean foreign material from the subgrade and complete the following:

1. Subgrade shall be well drained and of uniform load-bearing nature.
2. In-place density of subgrade soils shall be uniform throughout the area and at least the minimum required by Contract Documents.
3. Subgrade shall be free from frost or ice.
4. Subgrade shall be moist with no free water and no muddy or soft spots.
5. Where slipsheet is indicated on the Contract Drawings, slabs and foundations on grade shall be underlain with two layers of 8 mil. polyethylene sheeting, perforated to allow bleedwater to escape.

E. When high ambient temperatures necessitate protection of concrete immediately after placing or finishing, make provisions in advance of concrete placement for windbreaks, shading, fogging, sprinkling, ponding, or wet covering.

F. During ambient temperature conditions described in Section 03 31 00 - Concrete Mixtures, Paragraph 2.02.G, Concrete Temperature, make provisions in advance of concrete placement to maintain the temperature of the concrete as specified in 3.02.A.2. Use heating, covering, or other means adequate to maintain required temperature without overheating or drying of concrete due to concentration of heat. Do not use combustion heaters unless precautions are taken to prevent exposure of the concrete to exhaust gases containing carbon dioxide.

3.02 PLACEMENT OF CONCRETE

A. Wet Consideration:

1. Wet Weather. Do not begin to place concrete while rain, sleet, or snow is falling unless adequate protection is provided, and approval of protection is obtained from the Engineer.

2. Do not allow rain water to increase mixing water or to damage the surface of the concrete.

3. Cold Weather. Concrete temperatures and ambient temperatures shall meet minimum temperature requirements of Section 03 31 00 - Concrete Mixtures, Paragraph 2.02.G, Concrete Temperature. During cold weather, concreting procedures shall conform to Section 03 05 10.

4. Hot Weather. The temperature of concrete as placed shall not exceed 80ºF. Loss of slump, flash set, or cold joints due to temperature of concrete as placed will be rejected. When temperature of concrete would exceed 80ºF without special procedures, use procedures specified in Section 03 05 20. When temperature of steel reinforcement, embedments, or forms is greater than 120ºF, fog steel reinforcement, embedments, and forms with water immediately prior to placing concrete. Remove standing water prior to placing concrete.

5. Concrete Placed in Water. No concrete shall be placed underwater or in standing water unless specifically directed or approved by the Engineer and as provided for in these Specifications and shown on the Contract Drawings. Underwater concrete shall be placed using tremies or other special methods subject to approval by the Engineer, and only concrete mixtures specifically formulated for underwater placement shall be used.

B. Conveying: Convey concrete from mixer to the place of final deposit rapidly by methods which prevent segregation or loss of ingredients and will assure the required quality of concrete. Do not use aluminum pipes or chutes.

C. Conveying Equipment: Use acceptable conveying equipment of a size and design that will prevent cold joints from occurring. Clean conveying equipment before each placement.

1. Use belt conveyors that are horizontal or at a slope that will not cause excessive segregation or loss of ingredients. Project concrete to minimize drying and the effects of temperature rise. Use an acceptable discharge baffle or hopper at the discharge end to prevent segregation. Do not allow mortar to adhere to the return length of the belt.

2. Use metal or metal-lined chutes having rounded bottoms and sloped between 1 vertical to 2 horizontal and 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting slope requirements may be used provided the discharge is into a hopper before distributing into the forms.

3. Use pumping conveying equipment that permits placement rates that avoid cold joints and prevents segregation in discharge of pumped concrete.

D. Depositing: All concrete shall be delivered, discharged, and placed within the time limits specified in Section 03 31 00 - Concrete Mixtures, 3.02.B, Batch Ticket Information.

Deposit concrete continuously in one layer or in layers to have fresh concrete deposited on in-place concrete that is still plastic. Do not deposit fresh concrete on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section, unless construction joint requirements of 3.02.F are met.

Once concreting is started, it shall be carried on as a continuous operation until the placing of the panel or section is complete. Suspension of operations for more than 1½ hours will not be permitted during a continuous placement, and this limit may be shortened on order by the Engineer.

Concrete shall be placed generally in horizontal layers not more than 24 inches thick, except as otherwise specified. Each layer of concrete is regarded as a unit of masonry to be laid and worked before the succeeding layer can be superimposed in the process of monolithic construction. When a monolithic layer cannot be completed in one operation, it shall be terminated with a vertical bulkhead. Feathering out to less than 6 inches will not be permitted.

Concrete shall be placed so as to prevent segregation of the materials and the displacement of the reinforcement. Where placing operations would involve the dropping of concrete through completed forms from heights of 4 or more feet, concrete so placed shall be pumped or discharged into hoppers feeding into flexible drop chutes to within 2 feet of the concrete's final deposition point. Encrustation of installed reinforcement by concrete spilled on it will be tolerated only for a length of time shorter than the encrustating concrete needs for drying out.

Do not use concrete that has surface dried, partially hardened, or contains foreign material.

When temporary spreaders are used in the forms, remove the spreaders as their service becomes unnecessary. Spreaders made of metal or concrete may be left in place if prior acceptance is obtained.

Do not place concrete over columns and walls until concrete in columns and walls is no longer plastic and has been in place at least 1 hour.

Place concrete for beams, girders, brackets, column capitals, haunches, and drop panels at the same time as concrete for slabs.

When placing concrete for columns, do not exceed the top-of-pour elevation indicated on the Contract Drawings for the joint between the column and the slab or drop panel it supports.

When underwater placement is required or permitted, place concrete by an acceptable method. Deposit fresh concrete so concrete enters the mass of the previously placed concrete from within, displacing water with minimum disturbance to the surface of concrete.

E. Consolidating: Consolidate concrete by vibration. Concrete shall be thoroughly worked around reinforcement and embedded items and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Use internal vibrators of the largest size and power that can properly be used in the work. Workers shall be experienced in use of the vibrators. Do not use vibrators to move concrete within the forms.

The Contractor shall supply enough vibrators to consolidate the concrete (except that placed underwater) according to the requirements of this Section. Each vibrator must:

1. Be designed to operate while submerged in the concrete;
2. Vibrate at a rate of at least 7,000 pulses per minute; and
3. Receive the Engineer's approval on its type and method of use.

Immediately after concrete is placed, vibration shall be applied in the fresh batch at the point of deposit. In doing so, the Contractor shall:

4. Space the vibrators evenly, no farther apart than twice the radius of the visible effects of the vibration;
5. Ensure that vibration intensity is great enough to visibly affect a weight of 1-inch slump concrete across a radius of at least 18 inches;
6. Insert the vibrators slowly to a depth that will effectively vibrate the full depth of each layer, penetrating into the previous layer on multilayer pours;
7. Protect partially hardened concrete (i.e., nonplastic, which prevents the vibrator penetration when only its own weight is applied) by preventing the vibrator from penetrating it or making direct contact with steel that extends into it;
8. Not allow vibration to continue in one place long enough to form pools of grout;
9. Continue vibration long enough to consolidate the concrete thoroughly, but not so long as to segregate it;
10. Withdraw the vibrators slowly when the process is complete; and
11. Not use vibrators to move concrete from one point to another in the forms.

When vibrating and finishing top surfaces that will be exposed to weather or wear, the Contractor shall not draw water or laitance to the surface. In high lifts, the top layer shall be shallow and made up of a concrete mix as stiff as can be effectively vibrated and finished.

To produce a smooth, dense finish on outside surfaces, the Contractor shall hand tamp the concrete.

F. Construction Joints and Other Bonded Joints: Locate construction joints as indicated on the contract Drawings or as accepted in accordance with 1.03.3.a. The use of construction joints not shown on the Drawings is prohibited unless approved by the Engineer. Formed construction joints shall be thoroughly cleaned, laitance removed, and dampened prior to placement of fresh concrete. When bond is required or permitted, it shall be achieved by one of the following:

1. Use an acceptable adhesive applied in accordance with the manufacturer's recommendations.
2. Use an acceptable surface retarder in accordance with the manufacturer's recommendations.
3. Roughen the surface in an acceptable manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, or damaged concrete at the surface.
4. Use portland cement grout of the same proportions as the mortar in the concrete in an acceptable manner.

G. Contraction/Control Joints: The location of contraction or control joints shall be as shown on the plans or as approved by the Engineer. Contraction joints shall be saw cut, preformed, or tooled ¼ inch wide by ¼ of the slab depth, but not less than 1½ inches deep, unless otherwise detailed on the Contract Drawings. Contraction joints shall be finished with backing rod and sealant.

H. Pipe Penetrations: Where pipes pass through the structure, they shall be cast in place, unless permission is given by the Engineer to do otherwise. Whenever these requirements interfere with the placement of reinforcing steel as indicated by the Contract Drawings, the bars shall be spread and rearranged as directed by the Engineer.

3.03 FINISHING FORMED SURFACES

A. General: After removal of forms, in accordance with Table 3.03.A, give each formed surface one or more of the finishes described in 3.03.B, Matching Sample Finish; 3.03.C, As-Cast Finishes; or 3.03.D, Rubbed Finishes. When Contract Documents do not specify a finish, finish surfaces as required by 3.03.E, Unspecified Finishes.

Table 3.03.A

Location	**Finish Type**
Backfilled surfaces	Rough form finish
Interior wet well surfaces	Smooth form finish
All other surfaces	Grout-cleaned finish

B. Matching Sample Finish: When the finish is required by the Contract Documents to match a sample panel furnished to the Contractor, reproduce the sample finish on an area at least 100 square feet in a location designated by the Engineer and obtain acceptance before proceeding with that finish in the specified location.

C. As-Cast Finishes:

1. Rough Form Finish. Patch tie holes and defects. Chip or rub off fins exceeding ¼ inch in height. Leave surfaces with the texture imparted by the forms.

2. Smooth Form Finish. Patch tie holes and defects. Remove all fins completely.

3. Architectural Finishes. Produce architectural finishes including special textured finishes, exposed aggregate finish, and aggregate transfer finish in accordance with specifications for Architectural Concrete, if included in the Contract Documents.

D. Rubbed Finishes: Remove forms as early as permitted by Section 03 10 00 - Concrete Formwork; 3.02, Removal of Formwork. Produce one of the following finishes on concrete specified to have a smooth form finish:

1. Smooth Rubbed Finish. Remove forms as early as permitted by Section 03 10 00 and perform necessary patching. Produce finish on newly hardened concrete no later than the day following form removal. Wet the surface and rub it with carborundum brick or other abrasive until uniform color and texture are produced. Use no cement grout other than cement paste drawn from the concrete itself by the rubbing process.

2. Grout-Cleaned Finish. Begin cleaning operations after all contiguous surfaces to be cleaned are completed and accessible. Do not clean surfaces as Work progresses. Wet the surface and apply grout consisting of 1-part portland cement and 1½ parts fine sand with enough water to produce the consistency of thick paint. Add white cement as needed to match color of surrounding concrete. Scrub grout into all voids and remove all excess grout. When grout whitens, rub the surface and keep the surface damp for 36 hours afterwards.

3. Cork-Floated Finish. Perform necessary repairs. Remove ties, burrs, and fins. Wet the surface and apply stiff grout of one-part portland cement and one part fine sand, filling all voids. Add white cement as needed to match color of surrounding concrete. Use enough water to produce a stiff consistency. Compress grout into voids by grinding the surface with a slow-speed grinder. Produce the final finish with cork float, using a swirling motion.

E. Unspecified Finishes: When a specific finish is not specified in the Contract Documents for a concrete surface, apply the following finishes:

1. Rough form finish on all concrete surfaces not exposed to public view.

2. Smooth form finish on all concrete surfaces exposed to public view.

3.04 FINISHING UNFORMED SURFACES

A. Placement: Place concrete at a rate that allows spreading, straightedging, and darbying or bullfloating before bleed water appears.

Strike smooth the top of walls, buttresses, horizontal offsets, and other similar unformed surfaces, and float them to a texture consistent with finish of adjacent formed surface.

Finish slab surfaces in accordance with one of the finishes in 3.04.B, Finishes, as specified in Table 3.04.A.

Table 3.04.A: Finish Schedule

Location	**Finish Type**
Interior slabs	Troweled finish (with floor sealer, see Section 09 90 00)
Tops of footings or other backfilled surfaces	Floated finish
Exterior slabs, walks, and steps	Broom finish

B. Finishes:

1. Scratched Finish. Place, consolidate, strike off and level concrete, eliminating high spots and low spots. Roughen the surface with stiff brushes or rakes before the final set.
2. Floated Finish. Place, consolidate, strike off and level concrete, eliminating high spots and low spots. Do not work concrete further until it is ready for floating. Begin floating with a hand float, a bladed power float equipped with float shoes, or a powered disk float when the bleed water sheen has disappeared, and the surface has stiffened sufficiently to permit the operation. During or after the first floating, check flatness of surface with a 10-foot straightedge applied in two or more directions. Produce a conventional, straightedge finish in accordance with ACI 117, then refloat the slab immediately to a uniform texture.
3. Troweled Finish. Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled. Tolerance for concrete floors shall be conventional straightedge in accordance with ACI 117, unless otherwise specified. Concrete surfaces intended to support floor covering shall not have defects that will reflect through floor covering. See Section 09 90 00 for floor sealer on interior slabs.
4. Broom or Belt Finish. Immediately after concrete has received a steel-troweled finish, give the concrete surface a coarse transverse scored texture by drawing a broom or burlap belt across the surface.

5. Dry-Shake Finish. Blend metallic or mineral aggregate floor hardener with portland cement in the proportions recommended by the aggregate manufacturer, or use bagged premixed material as recommended by the manufacturer. Float finish the concrete surface. Apply approximately two-thirds of the blended material required for coverage to the surface by a method that ensures even coverage without segregation. Float finish the surface after application of the first dry-shake. Apply the remaining dry-shake material at right angles to the first application and in locations necessary to provide the specified minimum thickness. Begin final floating and finishing immediately after application of the dry-shake.

   After selected material is embedded by the two floating, complete operation with a broomed, floated, or troweled finish, as designated in the Contract Documents.

6. Heavy Duty Topping for Two-Course Slabs. For heavy duty topping mix, use materials and methods specified in Contract Documents. Place and consolidate concrete for the base slab and screed concrete to the specified depth below the top of the finish surface.

   Topping placed the same day as the base slab may be placed as soon as bleed water in the base slab has disappeared and the surface will support a person without appreciable indentation.

   When topping placement is deferred, brush the surface with a coarse wire broom to remove laitance and scratch the surface when concrete is plastic. Wet cure the base slab at least three days. Before placing the topping, clean the base slab surface thoroughly of contaminants and loose mortar or aggregate. Dampen the surface, leaving it free of standing water.

   Immediately before placing topping, scrub into the slab surface a coat of bonding grout consisting of equal parts of cement and fine sand with enough water to make a creamy mixture. Do not allow grout to set or dry before topping is placed. Bonding agents other than cement grout may be used with prior acceptance.

   Spread, compact, and float the topping mixture. Check for trueness of surface and float, trowel, or broom finish as specified.

7. Topping for Two-Course Slab Not Intended for Heavy Duty Service. Preparation of base slab, selection of topping material, mixing, placing, consolidating, and finishing operations shall be as specified in 3.04.B.6, Heavy Duty Topping for Two-Course Slabs, except that the aggregate need not be selected for special wear resistance.

8. Non-Slip Finish. Where a non-slip finish is required, give the surface a broom finish or belt finish or a dry-shake application of crushed aluminum oxide or other abrasive particles, as specified in the Contract Documents. Rate of application shall be not less than 25 pounds per 100 cubic feet.

9. Exposed Aggregate Finish. Immediately after surface of the concrete has been leveled to the specified straightedge method tolerance and the bleed water sheen has disappeared, spread aggregate of the color and size specified in Contract Documents uniformly over the surface to provide complete coverage to a depth of one stone.

Tamp the aggregate lightly to embed aggregate in the surface. Float the surface until the embedded stone is fully coated with mortar and the surface has been brought to a true plane within the specified straightedge tolerance. After the matrix has hardened sufficiently to prevent dislodgement of the aggregate, apply water carefully and brush the surface with a fine bristle brush to expose the aggregate without dislodging it.

An acceptable chemical retarder sprayed on freshly floated concrete surface may be used to extend the working time for the exposure of aggregate.

10. Non-Specified Finish. When the type of finish is not specified in Contract Documents, use one of the following appropriate finishes and accompanying tolerances.

    a. *Scratched Finish* — For surfaces intended to receive bonded cementitious mixtures.

    b. *Floated Finish* — For walks, drives, steps, ramps, and for surfaces intended to receive waterproofing, roofing, insulation, or sand-bed terrazzo.

    c. *Troweled Finish* — For floors intended as walking surfaces, floors in manufacturing, storage and warehousing areas, or for reception of floor coverings.

C. Finishing Tolerances for Slabs:

1. Finish floor slabs to meet the requirements of ACI 117 as specified in 3.04.B. Measure floor finish tolerances within 72 hours after slab finishing.

2. Unless otherwise specified in the Contract Documents, measure floor tolerances in accordance with the straightedge method in ACI 117.

3.05 SAWED CONTROL JOINTS

A. Where saw cut joints are required or permitted, start cutting as soon as concrete has hardened sufficiently to prevent dislodgement of aggregates. Saw a continuous slot to a depth of one-fourth the thickness of the slab but not less than one inch. Complete sawing within 12 hours after placement.

3.06 CURING AND PROTECTION

A. General: Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Protect concrete during the curing period such that the concrete temperature does not fall below below the requirements of Section 03 31 00 - Concrete Mixtures, Paragraph 2.02.G, Concrete Temperature. Cure concrete in accordance with Table 3.06.A and 3.06.C. for 7 days after placement. High early strength concrete shall be cured for 3 days after placement.

Alternatively, moisture retention measures may be terminated when:

1. Tests are made on at least two additional cylinders kept adjacent to the structure and cured by the same methods as the structure, and tests indicate 70 percent of the specified compressive strength f_c', as determined in accordance with ASTM C39.
2. Temperature of the concrete is maintained at 50ºF or higher for the time required to achieve 85 percent of f_c' in laboratory-cured cylinders representative of the concrete in place.
3. Strength of concrete reaches f_c' as determined by accepted non-destructive methods meeting the requirements of Section 03 10 00 - Concrete Formwork, 3.04.B, Strength of Concrete Required for Removal of Formwork.

Table 3.06.A: Curing Method Schedule

Location	Method
Floor slabs	Wet method only per 3.06.C.1
All other locations	Wet method (3.06.C.1) or curing compound method (3.06.C.2)

During and following curing, do not allow the surface of the concrete to change temperature more than the following:

- 50ºF in any 24-hour period for sections less than 12 inches in the least dimension.
- 40ºF for sections from 12 to 36 inches in the least dimension.
- 30ºF for sections 36 to 72 inches in the least dimension.
- 20ºF for sections greater than 72 inches in the least dimension.

The method of temperature measurement shall be accepted by the Engineer.

B. Formed Concrete Surfaces: Keep absorbent wood forms wet until they are removed. After form removal, cure concrete by one of the methods in 3.06.C, Preservation of Moisture.

C. Preservation of Moisture: After placing and finishing, use one of the following methods, as required by Table 3.06.A, to preserve moisture in concrete:

1. Wet Cure Method. Provide continuous moisture by ponding or watering a covering of heavy quilted blankets, by watering and covering with a white reflective-type sheeting, or by wetting the outside surfaces of wood forms. Runoff water shall be collected and disposed of in accordance with all applicable regulations. In no case shall runoff water be allowed to enter any lakes, streams, or other surface waters.

When curing slabs with wet heavy quilted blankets or burlap, a fog or mist spray of water shall be sprayed on the entire surface before the bleed water has evaporated. As soon as the concrete has achieved initial set, the surface shall be covered with presoaked heavy quilted blankets of burlap. The fog or mist spray shall be applied continuously until the presoaked heavy quilted blankets of burlap are placed. If the fog or mist spray cannot be applied continuously, two coats of curing compound shall be applied after the initial fog or mist spray application and before the presoaked heavy quilted blankets or burlap are placed.

Ponding may be used for slabs on grade.

2. Curing Compound Method. Application of a curing compound conforming to ASTM C309. Apply the compound in accordance with manufacturer's recommendation after water sheen has disappeared from the concrete surface and after finishing operations. The rate of application shall not exceed 150 square feet per gallon. Apply in two applications at right angles to each other, not to exceed 150 square feet per gallon for each coat. Do not use curing compound on any surface where concrete or other material will be bonded unless the curing compound will not prevent bond or unless measures are to be taken to completely remove the curing compound from areas to receive bonded applications.

   No later than the morning after applying the curing compound, the Contractor shall cover the top surfaces with white, reflective sheeting, leaving it in place for at least 10 days. Throughout this period, the sheeting shall be kept in place by taping or weighting the edges.

3.07 REPAIR OF SURFACE DEFECTS

A. General: Repair tie holes and surface defects immediately after form removal. Where the concrete surface will be textured by sandblasting or bush-hammering, repair surface defects before texturing.

B. Repair of Tie Holes:

1. Plug tie holes except where stainless steel ties, non-corroding ties, or acceptably coated ties are used, and omission of plugging is approved by the Engineer.
2. When portland cement patching mortar conforming to 3.07.E, Site Mixed Portland Cement Repair Mortar, is used for plugging, clean and dampen tie holes before applying the mortar.
3. When other materials are used, apply them in accordance with Manufacturer’s recommendations.
4. Finish tie holes flush with surrounding wall for concealed surfaces and exposed surfaces of tanks and channels. For other exposed surfaces, finish to leave a leave a reveal δ-inch deep, unless otherwise directed by the Engineer.

C. Repair of Surface Defects Other Than Tie Holes: Outline honeycombed or otherwise defective concrete with a ½- to ¾-inch-deep saw cut and remove such concrete down to sound concrete. When chipping is necessary, leave chipped edges perpendicular to the surface or slightly undercut. Do not feather edges. Dampen the area to be patched, plus another 6 inches around the patch area perimeter. Prepare bonding grout according to 3.07.D, Preparation of Bonding Grout. Thoroughly brush grout into the surface.

When the bond coat begins to lose water sheen, apply patching mortar prepared in accordance with 3.07.E, Preparation of Portland Cement Patching Mortar, and thoroughly consolidate mortar into place. Strike mortar leaving the patch slightly higher than the surrounding surface to permit initial shrinkage. Leave the patch undisturbed for 1 hour before finishing. Keep the patch damp for 7 days.

D. Preparation of Bonding Grout: For bonding grout, mix approximately one part of cement and one part of fine sand with water to a consistency of thick cream.

E. Site-Mixed Portland Cement Repair:

1. Mix repair mortar using the same materials as concrete to be patched with no coarse aggregate. Use not more than one-part cement to two and one-half parts sand by loose damp volume.
2. For repairs in exposed concrete, make a trial batch and check color compatibility of repair material with surrounding concrete. When the repair is too dark, substitute white portland cement for a part of the gray cement to produce a color closely matching surrounding concrete.
3. Use a repair mortar at a stiff consistency with no more mixing water than is necessary for handling and placing. Mix the repair mortar and manipulate the mortar frequently with a trowel without adding water. Use mortar at a stiff consistency.
4. Repair mortar may be used for holes at least 1-inch deep where the depth is equal to or greater than the smallest surface dimension of the defect, and for narrow slots cut for the repair of cracks. Do not use where lateral restraint cannot be obtained. Place and dry-pack mortar in layers having a compacted thickness of approximately 1 inch.
5. Solidly compact each layer over its entire surface by use of a hardwood stick and hammer. Do not use metal tools for compacting. compact surface just flush with adjacent area. Do not use steel finishing tools or water to facilitate finishing.

F. Repair Materials Other Than Site-Mixed Portland Cement Mortar: Materials other than site-mixed portland cement may be used for repair when prepared by the Engineer. Materials include, but are not limited to:

1. Shotcrete.
2. Commercial Patching Products. Including:
    a. Portland cement mortar modified with a latex bonding agent, conforming to ASTM C1059 Type II.

b. Epoxy mortars and epoxy compounds that are moisture-insensitive during application and after curing, which embody an epoxy binder that conforms to ASTM C881, Type III. The type, grade, and class shall be appropriate for the application as specified in ASTM C881.

c. Shrinkage-compensating or non-shrink portland cement grout, conforming to ASTM C1107.

d. Packaged dry concrete repair materials, conforming to ASTM C928.

G. Removal of Stains, Rust, Efflorescence and Surface Deposits: Remove stains, rust efflorescence and surface deposits considered objectionable by Engineer by acceptable methods.

H. Concrete Replacement: Use concrete replacement for:

1. Holes extending entirely through concrete sections.
2. For holes larger than 1 square foot and deeper than 4 inches in which no reinforcement is encountered.
3. For holes larger than ½ of 1 square foot where reinforcement is exposed.

Concrete used for replacement shall be the same strength and mixture as used in the structure.

END OF SECTION 03 30 00

SECTION 03 31 00
CONCRETE MIXTURES

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers the requirements for materials, proportioning, production, and delivery of concrete.

1.02 REFERENCES

A. ACI Standards:

1.	ACI 117	Specifications for Tolerances for Concrete Construction and Materials

B. ASTM Standards:

1.	C33/C33M	Standard Specification for Concrete Aggregates
2.	C39/C39M	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
3.	C94/C94M	Standard Specification for Ready-Mixed Concrete
4.	C138/C138M	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
5.	C143/C143M	Standard Test Method for Slump of Hydraulic-Cement Concrete
6.	C150/C150M	Standard Specification for Portland Cement
7.	C173/C173M	Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method
8.	C192/C192M	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
9.	C231/C231M	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
10.	C260/C260M	Standard Specification for Air-Entraining Admixtures for Concrete
11.	C387/C387M	Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete
12.	C494/C494M	Standard Specification for Chemical Admixtures for Concrete
13.	C595/C595M	Standard Specification for Blended Hydraulic Cements
14.	C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

15.	C685/C685M	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
16.	C845/C845M	Standard Specification for Expansive Hydraulic Cement
17.	C989/C989M	Standard Specification for Slag Cement for Use in Concrete and Mortars

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals submit the following Project Data:

1. Mixture Proportions: Submit concrete mixture proportions and characteristics.
2. Mixture Proportion Data: Submit field test data used to establish the required average strength in accordance with Paragraph 2.03.C, Required Average Compression Strength. Submit for acceptance test data used to establish the average compression strength of the mixture in accordance with Paragraph 2.03.D, Documentation of Required Average Strength.
3. Concrete Materials: Submit the following information for concrete materials, along with evidence demonstrating compliance with Paragraph 2.01, Materials:
    a. For Cementitious Materials. Types, classes, producers' names, plant locations, and evidence not more than 90 days old demonstrating compliance with Paragraph 2.01, Materials.
    b. For Aggregates. Types, pit or quarry locations, producers' names, gradations, specific gravities and evidence not more than 90 days old demonstrating compliance with Paragraph 2.01, Materials.
    c. For Admixtures. Types, brand names, producers, catalog, and certification data.
    d. For Water and Ice. Source of supply.
4. Field Test Data Basis: When field test data is used as a basis for selecting proportions for a concrete mixture, submit data on materials and mixture proportions, with supporting test results confirming conformance with specified requirements.
5. Mixture Proportion Adjustments: Submit any adjustments to mixture proportions or changes in materials, along with supporting documentation, made during the course of the Work.
6. Floor Concrete: Submit evaluations and test results verifying adequacy of concrete to be placed in floors when cementing content is less than the minimum specified in Table 2.02.A.
7. Calcium Chloride: Calcium chloride shall not be added to the concrete.
8. Volumetric Batching: When it is desired to produce concrete by the volumetric batch method, submit request along with description of proposed method.

9. Time of Discharge: When it is desired to exceed time for discharge of concrete required by ASTM C94, submit a request along with a description of the precautions to be taken.

1.04 QUALITY ASSURANCE

A. The Contractor shall maintain records verifying materials used are of the specified and accepted types and sizes and are in conformance with the requirements of Paragraph 2.01, Materials.

B. The Contractor shall assure that production and delivery of concrete conform to the requirements of Paragraph 3.01, Measuring, Batching and Mixing and Paragraph 3.02, Delivery.

C. The Contractor shall assure that the concrete produced has the specified characteristics in the freshly mixed state and that they are maintained during transport and delivery.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Cementitious Material: Store cementitious materials in dry weathertight buildings, bins, or silos which will exclude contaminants.

B. Aggregates: Store and handle aggregate in a manner that will avoid segregation and prevent contamination with other materials or other sizes of aggregates. Store aggregates to drain freely.

Do not use aggregates that contain frozen lumps.

C. Water and Ice: Protect mixing water and ice from contamination during storage and delivery.

D. Admixtures: Protect and store admixtures against contamination, evaporation, or damage. Provide agitating equipment for admixtures used in the form of suspensions or non-stable solutions to ensure thorough distribution of ingredients. Protect liquid admixtures from freezing and from temperature changes which would adversely affect their characteristics.

PART 2 : PRODUCTS

2.01 MATERIALS

A. Cementitious Material: Cementitious material shall consist of portland cement conforming to ASTM C150, with or without the addition of cementitious or pozzolanic mineral admixtures conforming to ASTM C618 or ASTM C989, or blended hydraulic cement conforming to ASTM C595. Unless otherwise specified, cementitious material shall conform to ASTM C150 Type I or Type II, without the addition of cementitious or pozzolanic mineral admixtures. The tricalcium aluminum (Ca_3Al) content of the portland cement shall be less than 8 percent in all concrete. In addition, cement shall meet the heat of hydration limits of Table 4 in ASTM C150. Cement for shrinkage compensating concrete shall conform to ASTM C845.

Cementitious material used in concrete shall be the same brand and type, and from the same plant of manufacture as the cementitious material used in the concrete represented by the submitted field test data or used in the trial mixtures.

B. Aggregates: Aggregates shall conform to ASTM C33 unless otherwise specified. When a single size or a combination of two or more sizes of coarse aggregates are used, the final gradation shall conform to the grading requirements of ASTM C33 unless otherwise specified or permitted.

Aggregates used in concrete shall be obtained from the same sources and have the same size ranges as the aggregates used in the concrete represented by submitted historical data or used in trial mixtures.

C. Water and Ice: Mixing water for concrete and water used to make ice shall meet the requirements of ASTM C94.

D. Admixtures: Admixtures shall meet the requirements of the following:

1. Provide admixtures produced and serviced by an established, reputable manufacturer, used in compliance with Manufacturer's recommendations. All of the admixtures used shall be from the same manufacturer and compatible with each other.

    a. *Air-entraining admixture:* Conform to ASTM C260. Admixture shall contain no chlorides and shall be capable of maintaining the air percentage as batched, within ±2% at point of placement, for 2 hours.

    b. *Water-reducing set, set-controlling admixture:* Conform to ASTM C494, Type A or D. Admixture shall contain no chlorides and shall be compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the Manufacturer's recommendations to obtain at least 12% water reduction. No retarder shall be used without Engineer's approval. Submit written proposed details of use.

    c. *Non-chloride, non-corrosive accelerators* Conform to ASTM C494, Type E, Admixture, shall be non-chloride and shall not promote corrosion of reinforcing steel in concrete.

    d. *High-range water reducer:* Conform to ASTM C494, Type F or G. The admixture shall be free of chlorides and alkalines. Water reducers shall be batch plant added.

    e. *Fly ash:* ASTM C618, Class F, maximum 2% loss on ignition.

    f. *Fiber reinforcement:* Fiber reinforcement shall be nominal ½-inch fibrillated polypropylene, Fibermesh, W.R. Grace, or other approved polypropylene product designed specifically for control of shrinkage and drying cracking in portland cement concrete.

    g. *Retarding admixture:* Confirm to ASTM A494, Type B.

Admixtures used in concrete shall be the same as those used in the concrete represented by submitted field test data or used in trial mixtures.

E. Change of Materials: When brand type, size, or source of cementitious materials, aggregates, water, ice, or admixtures are proposed to be changed, new field data or data from new trial mixtures or evidence which indicates that the change will not adversely affect the relevant properties of the concrete shall be submitted for acceptance prior to use in concrete.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

A. Cementitious Material Content:

1. The cementitious material content shall be adequate for concrete to satisfy the specified requirements for strength, water-cement ratio, and finishing ability. Not more than 20% fly ash may be substituted for portland cement at the Contractor's option. However, mix designs with fly ash shall not be used for floor slabs.

2. For concrete used in floors, cement content shall not be less than indicated in Table 2.02.A unless approved by the Engineer. Acceptance of a lower cement content will be contingent upon verification that concrete mixtures with a lower cement content will meet the specified strength requirements and will produce concrete with equal finish quality, appearance, durability, and surface hardness.

3. When a history of finishing quality is not available, evaluate the proposed mixture by placing concrete in a slab at the job using job materials, equipment, and personnel. The slab shall be at least 8 feet square and have an acceptable thickness. Slump shall not exceed the specified slump. Submit the evaluation results for acceptance.

Table 2.02.A: Minimum Cement Content Requirements

Nominal Maximum Size of Aggregate (in.)	Minimum Cement Content (lb/yd)
1½	470*
1	520
3/4	540
3/8	610

**Minimum cement content shall be 501 lb/yd^3 if concrete will be exposed to freezing and thawing in the presence of de-icing chemicals.*

B. Slump: Concrete shall have, at the point of placement, slump in accordance with Table 2.02.B. Determine the slump by ASTM C143. Slump tolerances shall meet the requirements of ACI 117.

Concrete with a high-range water reducing admixture may exceed the maximum slump by 2 inches while the admixture is effective.

Table 2.02.B: Slump Schedule		
	Minimum	**Maximum**
Slabs	2”	4”
Footings	3”	6”
Walls	2”	5”

C. Size of Coarse Aggregate: Except when otherwise specified or permitted, nominal maximum size of coarse aggregate shall not exceed ¾ of the minimum clear spacing between reinforcing bars; $^1/_5$ of the narrowest dimension between sides of forms; or α of the thickness of slabs or toppings.

D. Air Content:

1. Unless otherwise specified, all concrete shall be air-entrained. Unless otherwise specified, air content at the point of delivery shall conform to the requirements of Table 2.02.D for severe exposure.
2. For specified compressive strengths above 5,000 psi, the total air contents indicated in Table 2.02.D may be reduced by 1 percent.
3. Air content shall be measured in accordance with ASTM C138, C173, or C231. ASTM C231 shall be the preferred method.
4. Maximum air entrainment shall not exceed 3 percent for interior floor slabs to receive floor hardener and sealing compound.

Table 2.02.D: Total Air Content* of Concrete for Various Sizes of Coarse Aggregate			
Nominal Max. Size of Aggregate (in.)	**Total Air Content, + Percent**		
	Severe Exposure	**Moderate Exposure**	**Mild Exposure**
Less than 3/8	9	7	5
3/8	7.5	6	4.5
½	7	5.5	4
¾	6	5	3.5
1	6	4.5	3
½	5.5	4.5	2.5
2	5	4	2
3	4.5	3.5	1.5
6	4	3	1
**Measured in accordance with ASTM C138, C173, or C231.* *+Air content tolerance is +1-1½ percent.*			

E. Admixtures: When admixtures are specified in the Contract Documents for particular parts of the Work, use the types specified.

1. Water-reducing admixtures may be used at the option of the Contractor.

2. Accelerators shall not be used without the approval of the Engineer.
3. Provide fiber reinforcement at an application rate of 1.5 lb/fiber per cubic yard of concrete where fiber reinforcement is specified.

F. Concrete Class and Location: The proportions of cement, aggregate, and water for concrete shall be determined by the Contractor and subject to the requirements of this Section. Concrete shall meet the following criteria:

Property	Class A	Class B	Class C	Class D
Cement type	C150 Type 2	C150 Type 2	C150 Type 2	C150 Type 2
Max. water/cementitious ratio	0.45	0.50	0.50	0.58
Entrained air	Yes	Yes	Yes	No
Compressive Strength (PSI)	4000	6000	4000	3000

Class	Location
A	Slabs, equipment base slabs, and stairs on ground
B	Not Used
C	All reinforced concrete other than Class A and B locations
D	Unreinforced concrete used for thrust blocks, channel filler, and other non-structural general uses

G. Concrete Temperature: When the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40ºF for more than 3 successive days, concrete shall be delivered to meet the following minimum temperature immediately after placement:

- 55ºF for sections less than 12” in the least dimension
- 50ºF for sections 12” to 16” in the least dimension
- 45ºF for sections 36” to 72” in the least dimension
- 40ºF for sections greater than 72” in the least dimension

The temperature of concrete as placed shall not exceed these values by more than 20ºF.

These minimum requirements may be terminated when temperatures above 50ºF occur during more than half of any 24-hour duration.

Unless otherwise specified or permitted, the temperature of concrete as delivered shall not exceed 90ºF.

H. Water-Cementitious Material Ratio: The compressive strength and, when required, the water-cementitious material ratio of the concrete for each portion of the work shall be as specified in Paragraph F above.

1. If cementitious or pozzolanic mineral admixtures conforming to ASTM C618 or ASTM C989 are uses, the cement portion of the water-cement ratio shall be the total weight of cementitious materials.
2. The maximum weight of fly ash, pozzolan or ground granulated blast-furnace slag that is included in the calculation of water-cementitious material ratio shall not exceed the following percentages of the total weight of Portland cement plus fly ash, pozzolan, and ground granulated blast-furnace slag.
    a. The combined weight of fly ash and pozzolan conforming to ASTM C618 shall not exceed 25 percent of the total weight of cementitious material. The fly ash and pozzolan present in an ASTM Type IP or IPM blended cement conforming to ASTM C595 shall be included in the calculated percentage.
    b. The weight of ground granulated blast-furnace slag conforming to ASTM C989 shall not exceed 50 percent of the total weight of cementitious material. The slag used in manufacture of Type IS or ISM blended hydraulic cement conforming to ASTM C595 shall be included in the calculated percentage.
    c. If fly ash or pozzolan is used in concrete with ground granulated blast-furnace slag, the portland cement constituent conforming to ASTM C150 shall not be less than 50 percent of the total weight of cementitious material. Fly ash or pozzolan shall constitute no more than 20 percent of the total weight of cementitious material.

2.03 PROPORTIONING

A. Proportion concrete to conform with Paragraph 2.02, Performance and Design Requirements and the Structural General Notes, to provide workability and consistency so concrete can be worked readily into forms and around reinforcement without segregation or bleeding, and to provide an average compressive strength adequate to meet acceptance requirements of Specification Section 03 00 00 - Concrete General Requirements, Paragraph 1.06.G.1, Standard Molded and Cured Strength Specimens.

If the production facility has records of field tests performed within the past 12 months and spanning a period of not less than 60 calendar days for a class of concrete within 1,000 psi of that specified for the Work, calculate a standard deviation and establish the required average strength f_c' in accordance with Paragraphs 2.03.B and 2.03.C.1. If field test records are not available, select the required average strength from Table 2.03.C.2.

B. Standard Deviation: Where a concrete production facility has test records, a standard deviation shall be established. Test records from which a standard deviation is calculated:

1. Must represent materials, quality control procedures, and conditions similar to those expected, and changes in materials and proportions within the test records shall not have been more restricted than those for proposed work.

2. Must represent concrete produced to meet a specified strength or strengths f_c' within 1,000 psi of that specified for the proposed work.

3. Must consist of at least 30 consecutive tests, or two groups of consecutive tests, totaling at least 30 tests, except as provided below.

   Where a concrete production facility does not have test records meeting the above requirements but does have a record based on 15 to 29 consecutive tests, a standard deviation must be established as the product of the calculated standard deviation and the modification factor in Table 2.03.C.1. To be acceptable, the test record must meet the requirements of Items 1 and 2 and represent only a single record of consecutive tests that span a period of not less than 45 calendar days.

C. Required Average Compressive Strength: Calculate the required average compressive strength f_c' for the specified concrete in accordance with one of the following:

1. Use the standard deviation calculated in accordance with Paragraph 2.03.B to establish the required average compressive strength as follows:

   $F_c' = F_c' + 1.34\ ks$

   $F_c' + 2.33\ ks - 500$

where:

F_c' = required average compressive strength
F_c' = specified compressive strength
s = Standard deviation calculated in accordance with Paragraph 2.03.B
k = factor from Table 2.03.C.1 for increase in standard deviation if the total number of tests is less than 30

The larger of the two values of F_c' calculated in accordance with Paragraph 2.03.C.1 shall be used.

Table 2.03.C.1: *k*-Factor for Increasing the Standard Deviation for Number of Tests Considered

Total No. of Tests Considered	*k*-Factor for Increasing Standard Deviation
15	1.16
20	1.08
25	1.03
30 or more	1.00
Linear interpolation for intermediate number of tests is acceptable.	

2. When field test data is not available to establish a standard deviation, select the required average compressive strength F_c' from Table 2.03.C.2.

Table 2.03.C.2: Required Compessive Strength F_c' When Data Is Not Available to Establish a Standard Deviation

Specified Strength $F_c'N$	Required Average Compressive Strength $F_c'N$
Less than 3,000 psi	F_c' + 1,000 psi
3,000 to 5,000 psi	F_c' + 1,200 psi
Over 5,000 to 10,000 psi	F_c' + 1,400 psi
Over 10,000 to 15,000 psi	F_c' + 1,800 psi
Less than 3,000 psi	F_c' + 1,000 psi
3,000 to 5,000 psi	F_c' + 1,200 psi

D. Documentation of Required Average Compressive Strength: Documentation demonstrating that the proposed concrete proportions will produce an average compressive strength equal to or greater than the required average compressive strength F_c' shall consist of field strength records or trial mixtures.

1. Field Test Data. If field test data is available and represents a single group of at least 10 consecutive strength tests for one mixture, using the same materials and under the same conditions encompassing a period of not less than 60 days, verify that the average of the field test results equals or exceeds F_c'. Submit for acceptance the mixture proportions along with the field test data.

   If the field test data represents two groups of compressive strength tests for two mixtures, plot the average strength X_1 and X_2, of each group versus the corresponding mixture proportions, and interpolate between corresponding mixture proportions to establish mixture proportions for F_c'.

2. Trial Mixtures. Establish mixture proportions based on trial mixtures in accordance with the following requirements:

   a. Use materials and material combinations proposed for the Work.

   b. Determine the required average compressive strength according to Paragraph 2.03.C.1 if suitable field test data is available or use Table 2.03.C.2.

   c. Make at least 3 trial mixtures complying with Paragraph 2.02, Performance and Design Requirements. Each trial mixture shall have a different cementitious material content. Select water-cementitious material content. Select water-cementitious material ratios that will produce a range of compressive strengths encompassing the required average compressive strength F_c'.

   d. Proportion trial mixtures to produce a slump within ¾" of the maximum specified, and for air-entrained concrete, an air content with 0.5 percent of the required total air content indicated in Table 2.02.D. The temperature of the freshly mixed concrete shall be recorded and shall be within 10°F of the intended maximum temperature of the concrete as mixed and delivered.

e. For each trial mixture, make and cure 3 compressive strength cylinders for each test age in accordance with ASTM C192. Test for compressive strength in accordance with ASTM C39 at 28 days or at the test age specified in the Contract Documents.

f. From results of these tests, plot a curve showing the relationship between water-cementitious material ratio and compressive strength.

g. From the curve of water-cementitious material ratio versus compressive strength, select the water-cementitious material ratio corresponding to the required average compressive strength F_c'. This is the maximum water-cementitious material ratio that may be used to establish mixture proportions unless a lower water-cement ratio is specified in Paragraph 2.02.H, Strength and Water-Cementitious Material Ratio.

h. Establish mixture proportions so that the maximum water-cementitious material ratio is not exceeded when slump is at the maximum specified.

E. Field Verification of Adequacy of Selected Proportions: Using materials accepted for use in the Work, verify in the field the adequacy of the selected proportions to produce concrete with the required total air content and consistency, and with workability compatible with the intended placing method. Make suitable corrections as necessary and submit for acceptance the adjusted proportions.

F. Revisions to Concrete Mixtures: When 15 consecutive compressive strength test results become available from the field, calculate the actual average compressive strength and standard deviation. Calculate a revised value for the average required compressive strength F_c' in accordance with Paragraph 2.03.B.1. Verify that both of the requirements of Specification Section 03 00 00 - Concrete General Requirements, Paragraph 1.06.G.1, Standard Molded and Cured Strength Specimens are met.

1. When the actual average compressive strength exceeds the revised value of F_c' and requirements of Paragraph 2.03.F are met, the required average compressive strength of the concrete F_c' may be decreased if the requirements of Paragraph 2.02. are met.

2. If the actual average compressive strength is less than the revised value of F_c', or if either of the two requirements in Paragraph 2.03.F are not met, take immediate steps to increase average compressive strength of the concrete.

3. Revised mixture proportions shall be submitted for acceptance prior to placing in the Work.

PART 3 : EXECUTION

3.01 MEASURING, BATCHING AND MIXING

A. Production facilities shall produce concrete of the specified quality and conforming to the requirements of this Specification.

1. Ready-Mixed and Site-Produced Concrete: Unless otherwise specified, measure, batch and mix concrete materials and concrete in conformance with ASTM C94.
2. Concrete Produced by Volumetric Batching and Continuous Mixing: When concrete made by volumetric batching and continuous mixing is permitted, it shall conform to the requirements of ASTM C685.
3. Prepackaged Dry Materials Used in Concrete: If packaged dry combined materials are used, they shall conform to the requirements of ASTM C387.

3.02 DELIVERY

A. Deliver concrete which will possess the specified characteristics in the freshly mixed state at the point of placing. Transport and deliver concrete in equipment conforming to the requirements of ASTM C94.

1. Slump Adjustment: When concrete arrives at the point of delivery with a slump below that which will result in the specified slump at the point of placement and is unsuitable for placing at that slump, the slump may be adjusted to the required value by adding water up to the amount allowed in the accepted mixture proportions when permitted by the Engineer. Addition of water shall be in accordance with ASTM C94. Do not exceed the specified water-cementitious material ratio or slump. Do not add water to concrete containing a plasticizing or a high-range, water-reducing admixture. Do not add water to concrete delivered in equipment not acceptable for mixing.

   Measure slump and air content of air-entrained concrete, after slump adjustment, to verify compliance with specified requirements.

2. Time of Discharge: Time for completion of discharge shall be within 60 minutes of the first addition of cement to the truck.

   This length of time may be extended, on a case-by-case basis, an additional 30 minutes at the discretion of the Engineer or the Owner's Resident Project Representative provided the mix remains fluid and placeable and shows no signs of stiffening or set.

   If delivery logistics make it impractical to discharge concrete within the above time limits, the Contractor may use an approved retarder admixture, delay the introduction of mixing water until the truck is closer to the job site, or propose other means, subject to approval by the Engineer, to assure that concrete is in acceptable condition at the time of discharge.

B. Batch Ticket Information:

1. The manufacturer of the concrete shall furnish to the Contractor and to the Owner's Representative with each batch of concrete before unloading at the site, a delivery ticket on which is printed, stamped, or written, information concerning said concrete as follows:

   a. Name of ready-mix batch plant

b. Serial number of ticket

c. Date

d. Truck number

e. Name of purchaser

f. Specific designation of job (name and location)

g. Specific class or designation of the concrete in conformance with that employed in job specifications

h. Amount of concrete in cubic years (or cubic meters)

i. Time loaded or of first mixing of cement and aggregates

j. Water added by receiver of concrete and his initials

k. Reading of revolution counter at the first addition of water

l. Type and brand, and amount of cement

m. Type and brand, and amount of admixtures

n. Information necessary to calculate the total mixing water added by the producer. Total mixing water includes free water on the aggregates, water, and ice batched at the plant, and water added by the truck operator from the mixer tank

o. Maximum size of aggregate

p. Weights of fine and coarse aggregate

q. Ingredients certified as being previously approved

r. Signature or initials of ready-mix representative.

2. The Contractor shall keep a record of where in the work each batch was placed.

END OF SECTION 03 31 00

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SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 : GENERAL

1.01 SUMMARY

A. Section includes:

1. Doors: Seamless, hollow, or composite construction standard steel doors for interior and exterior locations.
2. Frames: Pressed steel frames for doors and other interior and exterior openings of following type:
   a. Welded unit type.

1.02 REFERENCES

A. ASTM Standards:

1.	A153/A153M	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
2.	A568/A568M	Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
3.	A1008/A1008M	Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
4.	A1101	Standard Specification for Sintered and Fully Dense Neodymium Iron Boron (NdFeB) Permanent Magnets

B. ANSI Standards:

1.	A115.1	Steel Door Preparation Standards
2.	A224.1	Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
3.	SDI-100	Recommended Specifications Standard Steel Doors and Frames

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

2. Shop Drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

    a. Provide schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.

3. Label Construction Certification: Submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.

1.04 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and as herein specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Owner; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide ¼-inch spaces between stacked doors to promote air circulation.

PART 2 : PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering standard steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Ceco Corp
2. SteelCraft Manufacturing Co.
3. Optimum Window Mfg.
4. Or equal.

2.02 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A1101 and ASTM A568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A1008 and ASTM A568.

C. Supports and Anchors: Fabricate of not less than 18-gage sheet steel.

D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A153, Class C or D, as applicable.

E. Shop Applied Paint: Apply after fabrication.

1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1.

2.03 STANDARD DOORS

A. Provide flush, seamless metal doors with top edges closed flush, seams continuously welded of SDI grades and models specified below or as indicated on drawings or schedules:

1. Exterior Doors: ANSI/SDI-100, Grade III, extra heavy-duty, Model 4, minimum 16-gage fabricator primed steel faces, R-value = 1.5 minimum, STC = 32 minimum, Design based on "Regent" by Ceco. In Door Schedule, Sheet A-8, noted as Type A.

B. Internal Stiffeners: Formed steel, 22-gauge, vertical stiffeners at 6-in. o.c. maximum, welded to each face of door at 5-in. o.c. intervals.

C. Insulation (where applicable): Polyurethane or mineral wool.

2.04 FRAMES

A. Type: Mitered and welded steel frames.

1. Exterior frames of 14-gauge cold-rolled steel with integral thermal break. Provide standard profiled frames as detailed.

2. At Exterior Fixed Lite w/thermal break frame, match frame design above. Fill frame cavity with insulation, all sides.

B. Anchors:

1. At concrete and reinforced CMU walls use 3/8-inch round countersunk flat head screws set in lead anchors.

2. Floor: Not lighter than 12-gauge, minimum two fasteners at each jamb.

3. Stops and Trim: Profiles indicated, 18-gauge.

C. Grout Solid: All hollow-metal door frames both man-door openings after installation. Coordinate block-outs with electric strikes, conduit chases, etc.

D. Door Silencers: Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames.

E. Plaster Guards: Provide minimum 26-gauge steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.05 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp, or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

1. Internal Construction: Manufacturer's standard 22-gauge vertical steel stiffeners, 6 in. apart, welded at not more than 5 in. o.c. with fiberglass insulation.
2. Clearances: Not more than 1/8 in. at jambs and heads.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled or hot-rolled steel.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series Specifications for door and frame preparation for hardware.

G. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.

H. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

I. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.

2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

PART 3 : EXECUTION

3.01 INSTALLATION

A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.

1. Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

2. In masonry and concrete construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry Tee anchors.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100.

3.02 ADJUST AND CLEAN

A. Primer Touchup: Immediately after erection, sand smooth any rusted or damaged areas of paint and appropriate touch-up.

B. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08 11 13

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SECTION 08 33 00
OVERHEAD COILING DOORS

PART 1 : GENERAL

1.01 SUMMARY

A. The work specified in this Section includes chain-operated overhead doors complete with hardware and accessories.

1.02 REFERENCES

A. ASTM Standards

1. A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.03 SUBMITTALS

A. Submittals shall be supplied in accordance with Section 01 33 00 - Submittals, as follows:

1. Manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of overhead coiling door. Provide operating instructions and maintenance information.
2. Shop drawings for special components and installations which are not fully dimensioned or detailed on manufacturers data sheets.

1.04 QUALITY ASSURANCE

A. Furnish the overhead coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

1.05 SYSTEM DESCRIPTION

A. Provide complete operating door assemblies, including door curtains, guides, counterbalance mechanism, hardware, operators, and installation accessories.

B. Provide manufacturer's standard inside lock mechanism.

PART 2 : PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers include, but are not limited to the following:

1. Cornell "Thermister"
2. R & S "Thermal- Guard"

3. Or equal.

2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Operation: Provide manual chain hoist operator consisting of endless steel hand chain, chain pocket wheel and guard, and geared reduction unit with maximum 35-lb. pull for door operation. Design chain hoist with self-locking mechanism allowing curtain to be stopped at any point in its travel and to remain in position until movement is reactivated. Furnish alloy steel hand chain with chain holder secured to operator guide.

B. Mounting: To be interior face-mounted on a prepared opening.

C. Slats: Assembled of interlocking minimum 22-gauge galvanized steel slats, or as required to meet wind load. Slats to be no less than $2^{5}/_{8}$" high, $^{7}/_{8}$" thick, U-Value 0.16 (0.91 W/m^2 K).

D. Insulation: Environmentally safe CFC-free polyurethane foam injected to fill all voids providing continuous insulation protection the full height of the slat. Insulation to be self-bonding to the two interior galvanized steel surfaces. R-value = 6.25.

E. Endlocks: Each end of alternate slats to be fitted with endlocks to act as a wearing surface in the guides and to maintain slat alignment.

F. Windload: Door construction designed to satisfy windload of 20 PSF or 110 MPH in the fully closed position, whichever is greater.

G. Gauge: Thickness of slat material to be as required by width of opening and windloading requirements.

H. Galvanizing: Zinc-coated in accordance with ASTM A653.

I. Bottom Bar: Curtain to be reinforced with a bottom bar consisting of two aluminum angles.

J. Weather Seal: Provide interwoven neoprene astragal at the bottom bar to act as a weather seal at the floor.

2.03 COUNTERBALANCING MECHANISM

A. Spring Counterbalance:

1. Counterbalance: Housed in a steel pipe of diameter and wall thickness to restrict maximum deflection to 0.03″ per foot of door width.
2. Springs: To be helical torsion type designed to include an overload factor of 25% and for optimum ease of operation. Springs are to be grease-packed and are to be mounted on a cold-rolled steel inner shaft.
3. Spring Tension: Adjustable from outside of end bracket plate.
4. Ball Bearing: Sealed, to minimize wear of pipe shaft rotation around inner shaft.

B. Bracket Plates:

1. Bracket Plates: Carrying pipe counterbalancing shaft are to be no less than ¼″ thickness and are to house ends of door coil.
2. Drive End Bracket Plate: Fitted with a sealed ball bearing.

C. Guide and Wall Angle Assembly:

1. Guides/Wall Angles: Structural steel angles of $^{3}/_{16}$″ minimum thickness.
2. Depth of Guide: To provide adequate slat penetration to satisfy specified windloading.
3. Guide Weather Seal: Furnish guide weather stripping to seal against face of slat.

2.04 HOODS

A. Hoods: To house coil are to be fabricated of No. 24 U.S. Gauge galvanized steel. Round.

B. Reinforcing: To be laterally reinforced to prevent sag.

C. Intermediate Hood Supports: Furnish where door width exceeds 16′-0″ (4877 mm).

D. Hood Baffle: Furnish neoprene hood baffle in hood to minimize air infiltration.

2.05 LOCKING

A. Hand Chain Lock: Locking bracket, mounted on guide angle.

2.06 FINISH

A. Ungalvanized Surfaces: To consist of a shop coat of rust-inhibiting metallic primer on exposed ferrous surfaces, except bearings.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Install door and operating equipment, complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports in accordance with final shop drawings, manufacturer’s instructions, and as specified herein.

B. Upon completion of installation, including work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion and fitting weathertight for entire perimeter.

END OF SECTION 08 33 00

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SECTION 08 70 00
DOOR HARDWARE

PART 1 : GENERAL

1.01 SUMMARY

A. This Section includes:

1. Door hardware and appurtenances.

B. Related Sections:

1. Section 08 11 13 - Hollow Metal Doors and Frames.
2. Section 09 90 00 - Building Painting.

1.02 REFERENCES

A. ANSI Standards

1. DHI A115.1G -1994 Installation Guide for Doors and Hardware.
2. A156.18 Materials and Finishes

B. NAAMM HMMA standards and guidelines, including 840-07: Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Submittals shall be prepared by an Architectural Hardware Consultant (AHC) licensed by the Door and Hardware Institute and stamped with the Door and Hardware Institute stamp indicating name, membership/license number and expiration date.
2. Submit the following for approval:
    a. Provide separate finish hardware schedule for each door.
    b. Include the manufacturers name, model description, finish, and fasteners for each hardware item.
    c. Submit product data (catalog cut sheets) with the finish hardware schedule for all items.
    d. Provide keying schedule including stamping requirements.
    e. Provide samples when requested; samples shall be returned.

3. Operations and Maintenance Data:

   a. Include "as built" finish hardware schedule, templates, operation narratives, wiring diagrams, exploded views with part numbers, warrantees, and installation instructions as part of the project operations and maintenance manual for the Owner's use.

1.04 QUALITY ASSURANCE

A. Supply doors, frames, and hardware from a single-source supplier with not less than five years' experience furnishing finish hardware for similar projects, and an office and warehouse within a 100-mile radius of the project.

1.05 WARRANTEES

A. Furnish Manufacturers Warranties covering defects in materials and workmanship.

1.	Butt Hinges	Life of the Building
2.	Locks (Mechanisms)	Life of the Door
3.	Door Closers	25 Years
4.	All other Hardware	1 Year.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver hardware to the project in the manufacturer's original packages. Mark all boxes with door and heading number listed in the hardware schedule. Mark cartons with hardware for multiple doors with a designation cross-referenced to the hardware schedule packing list. Store products in a clean, dry, and secure area.

B. Upon delivery, inspect products for damage. Repair or replace damaged products before installation.

PART 2 : PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:

1. Hager Companies - St. Louis, Missouri
2. Marks-USA - Amityville, New York
3. Dorma-USA - Reamstown, Pennsylvania.

2.02 MATERIALS

A. Fasteners:

1. Furnish fasteners as required for the proper installation of the hardware.

2. Install with the manufacturers supplied fasteners and, in a manner, to maintain warrantees and labels.

2.03 FINISHES

A. Finishes and Base Materials:

1. Comply with ANSI A156.18.
2. Furnish as indicated in hardware sets.

2.04 KEYING

A. Security:

1. All locks and cylinders shall have construction cores. Plastic thumb turns shall not be used.
2. Construction keys will be issued to the Contractor and Owner for use during construction.
3. Permanent keys and cylinders will be provided and installed by Owner.

2.05 HARDWARE SETS

A. Single Leaf Door, Exterior:

1.	3 Each Hager	BB1199 4 1/2" x 4 1/2" US32D NRP hinges.
2.	1 Each Marks	5 RW 20 FW / US32D - G1 mortise lock.
3.	1 Each Marks	RC1182 / US3 construction core.
4.	1 Each Dorma	8916 SDST 689 closer with hold open.
5.	1 Each Hager	194S - US32D - 10" x 34" kick plate.
6.	1 Each Hager	743S MIL N automatic door bottom, neoprene.
7.	1 Each Hager	810S MIL40" overhead drip guard.
8.	1 Each Hager	417S MIL x 36" 1/4-20-SA threshold.
9.	Kerfed Weatherstrip by Hollow Metal Manufacturer.	

PART 3 : EXECUTION

3.01 INSTALLATION

A. Examine frame, door, and hardware before their installation for any problems that may affect proper function. Do not proceed with installation until corrections are made.

B. The hardware supplier shall visit the project before hardware installation, verify suitable conditions, and check the hardware with the Contractor and installer for any shortages or shipment damage. The supplier shall instruct the installer on any special conditions and adjustments required.

C. Install with proper tools in accord with the manufacturers' instructions. Install hardware securely with fasteners furnished by the manufacturer so as to maintain fire labels and warrantees. Provide proper adjustment for smooth functioning.

D. Following installation, the Hardware Supplier shall verify the proper application of the hardware in accordance with the approved hardware schedule and verify proper installation and functionality. The supplier shall notify the Contractor and Engineer of any deviations. The supplier will instruct Owner personnel in the proper operation, adjustments, and maintenance of the hardware.

E. The Contractor shall remedy deviations and correct any defects in installation as directed by the Engineer.

F. Make final adjustments following HVAC system commissioning.

G. Protect from damage until the Owner accepts the project as complete.

END OF SECTION 08 70 00

SECTION 09 90 00
BUILDING PAINTING

PART 1 : GENERAL

1.01 SUMMARY

A. Coating systems for metal surfaces not galvanized per requirements otherwise.

B. Coating systems for doors and frames.

C. Coatings specified in this section will not be used for surfaces in contact with potable water. Where the project scope requires coating that may contact potable water, Products and application shall conform to the requirements of NSF/ANSI 61 - 2023 Drinking Water System Components - Health Effects (NSF 61).

1.02 REFERENCES

A. ASTM Standards

1.	D6	Standard Test Method for Loss on Heating of Oil and Asphaltic Compounds
2.	D4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
3.	F1869	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

B. Steel Structures Painting Council (SSPC):

1. SSPC-SP 1 - Solvent Cleaning.
2. SSPC-SP 2 - Hand Tool Cleaning.
3. SSPC-SP 3 - Power Tool Cleaning.
4. SSPC-SP10 / NACE No. 2, Near-White Blast Cleaning.
5. SSPC-SP11, Power Tool Cleaning to Bare Metal.
6. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete
7. SSPC-PA 2, Measurement of Dry Paint Thickness with Magnetic Gages.

1.03 DEFINITIONS

A. Definitions of Painting Terms: ASTM D16, unless otherwise specified.

B. Dry Film Thickness (DFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000 inch).

1.04 SUBMITTALS FOR REVIEW

A. Submit in accordance with Section 01 33 00 - Submittals.

B. Product Data: Submit manufacturer's Product data for each coating, including generic description, complete technical data, surface preparation, and application instructions. Submit manufacturer's Product data demonstrating certification and conformance to NSF 61 requirements for all interior coating.

C. Color Samples: Submit manufacturer's color samples showing full range of standard colors for Owners selection.

D. Manufacturer's Quality Assurance: Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.

E. Warranty: Submit coatings manufacturer's standard warranty.

1.05 SUBMITTALS FOR OWNER'S INFORMATION

A. Manufacturer's data for Product handling, storage, and application.

B. MSDS for coating Products.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Specialize in manufacture of coatings with a minimum of 10 years successful experience.
2. Able to demonstrate successful performance on comparable projects.
3. Single Source Responsibility: Coatings and coating application thinners shall be Products of a single manufacturer.

B. Applicator's Qualifications:

1. Experienced in application of specified coatings for a minimum of 5 years on projects of similar size and complexity to this Work.
2. Applicator's Personnel: Employ persons trained and experienced in application of specified coating systems.

C. Pre-Application Meeting: Convene a pre-application meeting on the first day of production before start of application of coating systems. Require attendance of parties directly affecting work of this section, including Contractor, Engineer, NACE Coating Inspector, Applicator, and coating Product manufacturer's representative. Review the following:

1. Environmental requirements.
2. Protection of surfaces not scheduled to be coated.
3. Surface preparation.
4. Application.
5. Curing.
6. Disinfection.

7. Repair.
8. Field quality control.
9. Cleaning.
10. Protection of coating systems.
11. One-year inspection.
12. Coordination with other work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying the following information. Include a copy of the MSDS for all Products with each shipment.

1. Coating or material name.
2. Manufacturer.
3. Color name and number.
4. Batch or lot number.
5. Date of manufacture.
6. Mixing and thinning instructions.

B. Storage:

1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Do not use materials beyond manufacturer’s shelf life limits.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Weather:

1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within relative humidity and air and surface temperature ranges in accordance with manufacturer’s instructions.
2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) minimum above dew point.
3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer’s instructions.
4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist, or when unsuitable conditions can be expected.
5. Wind: Do not apply coatings if wind velocity is above manufacturer’s limit.

B. Dust and Contaminants:

1. Schedule coating work to avoid excessive dust and airborne contaminants.
2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

PART 2 : PRODUCTS

2.01 GENERAL

A. All paint and coating Products to be in contact with potable water shall be selected and applied to conform to the requirements of NSF 61.

2.02 MANUFACTURER

A. Tnemec, Inc. Products are listed to show the generic type to be used. Substitutions shall be considered but must be approved by Engineer.

B. Standardization: Materials, supplies, and articles provided shall be the standard products of manufacturers. Paints in a particular coating system shall be the products of a single manufacturer.

Requests for substitutions, in accordance with Section 01 33 00, will be considered, provided the following minimum conditions are met:

1. The proposed coating system shall use an equal or greater number of separate coats to achieve the required dry film thickness.
2. The proposed coating system shall use coatings of the same generic type.
3. Requests for substitution shall have directions for application and descriptive literature which includes generic type, nonvolatile content by volume, and information confirming that the substitution is equal to the specified coating system.
4. Substitutions will not be considered which decrease film thickness, solids by volume or the number of coats to be applied or which propose a change from the generic type of coating specified herein. All substitutions shall include complete test reports to comply with specified performance criteria.

2.03 COATING SYSTEMS

A. System 1: Acrylic polymer finish for application on steel structural elements which are not galvanized, steel metal doors, frames and other similar applications.

1. Surface preparation: Clean entire surface and lightly abrade the factory primer all over
2. Intermediate coat: DFT = 2.0 – 4.0 mils, Tnemec Enduratone Series 1029 (semi-gloss). Use contrasting color from finish coat.

3. Finish coat: DFT = 2.0 – 4.0 mils, Tnemec Enduratone Series 1029 (semi-gloss).

B. System 2: Acrylic polymer water-based finish for application on PVC pipe exposed to weather.

1. Surface Preparation: SSPC - SP2; lightly sand to de-gloss plastic surfaces.
2. Prime Coat: By equipment manufacturer or provide if required.
3. Finish Coats: DFT = 2.0 to 4.0 mils; Tnemec Series 1029 or approved substitute. Apply two finish coats.

C. System 3: Galvanizing touch-up, aerosol can.

1. Surface preparation: SSPC – SP 1 and 2 or 3.
2. Spray apply Cold Galvanizing Compound, Rust-Oleum V2185838.

PART 3 : EX ECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which coating systems are to be applied. Notify Engineer of areas or conditions not acceptable. Do not begin surface preparation or application until unacceptable areas or conditions have been corrected.

3.02 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings. Provide notice at site entry to keep all personnel and site visitors apprised of any exterior preparation and coating work being performed.

B. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

C. Complete exterior preparation and coatings work so as to protect surrounding areas including site vegetation and neighboring properties.

3.03 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

B. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

3.04 APPLICATION

A. Apply coatings in accordance with manufacturer's instructions except that coating thickness specified in paint schedule herein shall govern.

B. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions. Do not exceed the interior coating thinning requirements per the NSF 61 Certification.

C. Keep containers closed when not in use to avoid contamination.

D. Do not use mixed coatings beyond pot life limits.

E. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.

F. Uniformly apply coatings at spreading rate required to achieve specified DFT.

G. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.

H. Scrape and remove overspray prior to interior finish coat application. Provide particular attention to horizontal weld seams.

3.05 REPAIR

A. Damaged Materials: Repair or replace damaged materials and surfaces not scheduled to be coated.

B. Damaged Coatings: Touch-up or repair damaged coatings. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch-up result is visibly different, either in sheen, texture, or color.

C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.06 FIELD QUALITY CONTROL

A. Inspector's Services shall be provided by the Owner:

1. Verify coatings and other materials are as specified.
2. Verify surface preparation, mixing and application are as specified.
3. Verify DFT of each coat and total DFT of each coating system is as specified using wet film and/or dry film gauges. DFT readings shall account for the base metal reading profile as per SSPC PA-2.
4. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.

a. Check for holidays on interior steel immersion surfaces up to the overflow using holiday detector. No surfactant shall be used with wet sponge holiday testing.

5. Report:

a. Submit written reports describing inspections made and actions taken to correct nonconforming work.

b. Report nonconforming work not corrected.

c. Submit copies of report to Engineer and Contractor.

B. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

3.07 CLEANING

A. Remove temporary coverings, plugs and protection of surrounding areas and surfaces.

3.08 PROTECTION OF COATING SYSTEMS

A. Protect surfaces of coating systems from damage until acceptance by the Owner.

3.09 ONE-YEAR INSPECTION

A. Owner will set date for one-year inspection of coating systems.

B. Inspection shall be attended by Owner, Contractor, Engineer, and coating.

C. Product manufacturer's representative.

D. Repair deficiencies in coating systems as directed by Engineer and in accordance with Product manufacturer's instructions.

PART 4 : SCHEDULE OF COATINGS APPLICATIONS

Coating Application Item / Area	Coating System	General Description of Coating System
Steel Building Members, Standard Steel Doors and Frames	System 1	Acrylic polymer water-based finish Color: Match Metal Roof Color
PVC pipe exposed to weather	System 2	Acrylic polymer water-based finish (CBO)
Galvanizing touchup	System 3	Cold galvanizing zinc spray, aerosol

(1) CBO = color by owner.

END OF SECTION 09 90 00

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SECTION 11 00 10
EQUIPMENT GENERAL PROVISIONS

PART 1 : GENERAL

1.01 SUMMARY

A. The provisions of this Section shall apply to Division 11 sections, unless specifically revised therein.

B. System requiring software to configure shall have the software and required cabling for set-up provided as part of the overall cost. PLC programs for equipment shall be provided with software, licensing, programming cables and interfaces, annotated hard copies of the programs, electronic copies of the PLC programs with documentation files included. Current programs and electrical prints with updated as-built information shall be provided no later than 30 days prior to Commissioning.

1.02 SUBMITTALS

A. The following list of submittal information shall be required for equipment and systems to be used for this project. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Descriptive literature, bulletins, and catalog cuts of the equipment.
2. Materials of construction.
3. Complete installation instructions, with points of electrical and plumbing connection requirements clearly shown.
4. Motor Data.
5. Performance curves.
6. Complete Performance Data at the Design Point.
7. List of recommended spare parts required for long term operation of five (5) years.
8. Sequence of operation or functional narrative.
9. Instrumentation and Wiring Diagram.
10. PLC logic and theory of operation for process controls and Human Machine Interfaces (HMIs).
11. Operator interface screens shall be presented for Owner approval prior to completion of process.
12. List of process control equipment organized by process referencing unique process ID numbers, the manufacturer and part number of this item, contact information for spare or replacement parts. The Engineer's approval of this list is required for acceptance of the Project.

B. Spare Parts:

1. A list of required spare parts is provided in the individual equipment section.

2. Spare equipment shall be provided in its original packaging and contain copies of installation and operation manuals.

1.03 WARRANTY

A. The Contractor shall warrant to the Owner both the equipment construction, the functioning of the equipment system, and the equipment performance, as specified herein. The Contractor shall warrant the equipment for a minimum of twelve (12) months from startup, not to exceed 18 months from factory shipment.

B. Individual equipment sections may contain additional warranty requirements and extended warranty periods. Contractor shall be responsible for procuring the required warranties for the individual equipment from the suppliers and vendors.

C. The Contractor shall guarantee the equipment and control system to be free of defects in design, materials, and workmanship. As part of the guarantee, the Bidder shall indemnify and hold harmless the Owner and Engineer and their officers, agents, and employees against and from claims and liability arising from damage and injury due to defects in the equipment and control system.

D. The Contractor shall make repairs, replacements, modifications, and adjustments necessary to eliminate defects in design, materials, and workmanship which are disclosed within the equipment warranty period. Repairs, replacements, modifications, and adjustments shall be started within one week (168 hours) of notification by telephone from the Owner, and shall be completed within ten (10) days of notification by the Owner. Shall the Contractor fail to begin the work within one hundred and sixty-eight (168) hours, or to complete the work within the ten (10) day period, the Owner may proceed to undertake or complete the work. In such event, the Contractor and his surety shall be liable for costs incurred by the Owner.

1.04 QUALITY ASSURANCE

A. Electrical equipment and materials specified herein shall be listed by and shall bear the label of Underwriters Laboratories (UL), Factory Mutual (FM) or other nationally recognized testing laboratory acceptable to the State of Washington Mechanical Inspections Division. Control panels shall be manufactured by a UL 508A panel shop and shall be UL listed as an assembly.

B. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the Drawings.

1.05 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be completely factory assembled, skid mounted, crated, and delivered to protect against damage during shipment.

B. Exposed flanges shall be covered and sealed with shrink-wrap to prevent the entrance of moisture. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

C. Equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

D. Box, crate, or otherwise completely enclose and protect equipment during shipment, handling, and storage.

E. Protect equipment from exposure to elements and keep items thoroughly dry at all times.

F. Store motors, electrical equipment, and other equipment with moving parts in weathertight warehouses at maintained temperature of 60°F minimum.

G. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Repaint to original factory specifications painted surfaces which are damaged prior to acceptance of equipment.

H. Protect electrical equipment, controls, and insulation against moisture or water damage.

I. Package spare parts or spare part assemblies in separate, sturdy, waterproof containers clearly marked with the name of the part or assembly, and the name of the unit of which it is a component.

1.06 ADAPTATION OF EQUIPMENT

A. Furnish equipment readily adaptable for installation and operation in the structure shown on the drawings. Equipment furnished shall be compatible with other equipment furnished.

B. Contractor shall assume full responsibility for alteration of the planned structure to accommodate other types of equipment. Assume full responsibility for modifications of mechanical and electrical controls, equipment, wiring, piping, as required to accomplish function contemplated by the contract documents.

C. Equipment which requires alteration of the structure, piping, and/or electrical work will be considered only if the Contractor assumes responsibility for making and coordinating necessary alterations.

D. Provide such alterations free of extra cost to the Owner.

PART 2 : PRODUCTS

2.01 EQUIPMENT

A. Provide equipment in accordance with applicable sections of Division 11.

B. Furnish each piece of equipment complete with its base, drives, shafting, couplings, controls, guards, and other appurtenances which are specified or required for proper and safe operation.

C. Electrical equipment provided as an integral portion of an individual piece of process equipment shall include a means of disconnect suitable for lockout and service as required by local, state, and federal codes.

D. Railings, stairs, guards, and platforms required to access equipment for operation and maintenance shall meet or exceed the most recent federal OSHA and state requirements.

E. Fabricate, assemble, erect, place and test specified materials and equipment in full conformity with contract document and manufacturer's recommendations.

F. Furnish special tools or equipment required for proper maintenance, testing, or adjusting.

2.02 EQUIPMENT FOUNDATIONS, BASES, AND PADS

A. Floor or floor stand-mounted equipment specified in Division 11 shall be set on concrete equipment pads as shown in the Contract Drawings. The height of the pads shall be as shown on the drawings. The height shall be sufficient to accommodate required anchorage devices.

B. The pads shall extend 3 inches minimum and 6 inches maximum beyond the machine base in all directions unless otherwise indicated on the drawings or by the equipment manufacturer. The top edges of the pads shall be chamfered.

C. Concrete work shall be in accordance with Division 3.

D. Anchor bolts shall be in accordance with Division 3 and the Drawings.

2.03 DRIVES AND GUARDS

A. Belt Drives: Each motor which is not directly connected to the driven equipment shall have grooved pulleys and V-belts designed for 125% of full rated horsepower of the motor. Driven equipment that starts fully loaded shall have belts designed for 150% of the full rated horsepower. The drive system shall be designed to prevent belts from jumping, squealing, or slipping at high speed. Motors and driven equipment shall be secured to a common base in a manner which allows adjustment of belt tension and alignment. The drive system shall have the following features:

1. Motor pulleys shall be steel and of the manually adjusted, variable pitch type, arranged to keep belts parallel throughout the entire adjustable range. At design speed, pulleys shall be set midway in the adjustment range. Multiple belt drives requiring three (3) or more belts shall not be of the variable speed type. Such drives shall be furnished with solid sleeves. Make allowance for one change of pulley size after installation to compensate for field conditions.

2. Pulleys and bushes shall be dynamically and statically balanced. Pulleys shall be separately mounted on the bushes by means of three pull-up grub or cap tightening screws. Bushes shall be key seated to the driver shaft.

3. Each belt driven unit shall be furnished with a complete set of spare belts. Spare belts shall be properly identified as to design, horsepower, speed, length, pulley size and use and shall be packaged and stored as specified for spare parts storage and marking. Where two (2) or more belts are required, matched sets of belts shall be provided.

4. V-belt drives shall conform to NEMA Standard NGI-3.15.

B. Direct Drives:

1. General. Shaft couplings for directly connected electric motor-driven equipment ½-horsepower or larger shall be Type I or Type II as specified herein. Type I couplings shall be utilized for reversing drives, positive displacement pumps, or high torque loads such as conveyor. Type II couplings shall be provided on other drives.

   a. Where requirements of the equipment dictate specialized features, the manufacturer may substitute the coupling normally supplied for the service. Couplings shall be nonlubricated type, designed for not less than 50,000 hours operating life.

   b. Couplings shall be as recommended by the manufacturer for the specific application, considering horsepower, speed of rotation, and type of service. The use of couplings as specified herein shall not relieve the Contractor of responsibility for precision alignment of direct-driven units.

2. Type I Couplings. Positive displacement pumps and reversing equipment or equipment where sudden torque reversal may be expected shall be connected to drivers by flexible couplings which can accommodate angular misalignment, parallel misalignment and end float, and which cushions shock loads and dampens torsional vibrations. The flexible member shall consist of a built-up elastic member comprised of synthetic rubber, duck and wire reinforcement with synthetic tension members bonded together in rubber. The flexible member shall be attached to flanges by means of clamping rings and cap screws, and the flanges shall be attached to the stub fit. There shall be no metal-to-metal contact between the driver and driven unit.

3. Type II Couplings. Type II couplings shall be employed on normal torque, nonreversing applications. The Type II couplings shall be of the pin and preloaded neoprene cylinder type, designed to accommodate shock loadings, vibration, and shaft misalignment or offset. Stub shafts shall be connected through collar or round flanges, firmly keyed to their shafts, to neoprene cylinders held to individual flanges by through pins. Couplings with cylinders pinned to both couplings will not be acceptable.

C. Guards:

1. Guards shall be fabricated from 12-gage steel and expanded metal screen to provide visual inspection of moving parts without removal of the guard. Guards shall be galvanized or painted after fabrication and shall be designed to be readily removable to facilitate maintenance of moving parts.

2. Fully enclosed belt drive guards shall have trimmed openings at both shafts for tachometer readings, with motor shaft opening slotted to permit adjustment for belt takeup. Fabricate guard to sufficient length to permit installation of 2-inch larger driven pulleys without alteration to the guard.

3. Secure guards to the driven equipment or to the foundations with heavy angle supports and only three (3) anchor bolts. Do not secure braces or supports to motors. Do not bridge sound and vibration isolators with braces or supports.

2.04 BEARINGS

A. Unless otherwise specified, equipment bearings shall be oil or grease lubricated, ball or roller antifriction type of standard manufacture. Bearings shall be conservatively designed to withstand stresses of the service specified. Each bearing, except when otherwise noted, shall be rated in accordance with the latest revisions of the AFBMA Methods of Evaluating Load Ratings of Ball and Roller Bearings for one of the following classes of B-10 rating life:

Class M2	20,000 hours of operation
Class M3	50,000 hours of operation
Class M4	100,000 hours of operation

Bearings shall not be less than Class M3 unless otherwise noted.

B. Grease lubricated bearings, except those specified to be factory lubricated for life, shall be fitted with easily accessible grease supply, flush, drain, and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be the standard hydraulic type.

C. Oil lubricated bearings shall be equipped with either a pressure lubrication system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 40C and shall be equipped with a filler pipe and external level gage.

D. During transportation, bearings shall be suitably blocked or otherwise protected to avoid work hardening or “Brinelling” damage from vibration. Bearings shall be separately packed if necessary to comply with this requirement.

2.05 SEALS

A. Mechanical Seals:

1. Mechanical seals may be internal or external type, balanced or unbalanced type, and single or double seals except as herein specified.
2. An internal type seal may be used where clean sealing liquid is provided, either from the pumped liquid or an external source. When the pumped liquid is corrosive, abrasive, toxic or flammable, an internal double seal shall be provided with adequate sealing fluid pressure to prevent entry of the pumped liquid into the seal chamber, or an external seal may be provided. The sealing liquid shall be within the temperature limits and at the flushing rate recommended by the equipment manufacturer.
3. The seal may be balanced or unbalanced as recommended by the equipment manufacturer. To maintain the necessary minimum or maximum pressure across the seal faces, spring pressure shall be uniformly distributed to the sealing faces by a coil spring or multiple springs. The rotating seal element shall be clamped to the shaft and provided with O-ring or gasket material.
4. Seal faces shall be tungsten carbide to tungsten carbide, except on the double seal where the seal in contact with the pumped liquid shall be carbon. The O-ring gasket material shall be as recommended by the manufacturer for the liquid being pumped. Other parts shall be stainless steel.

B. Stuffing Box:

1. Each stuffing box shall be cast separately, bolted to the bearing frame, tapped to permit installation of a clean liquid seal, and shall be of sufficient size and depth to hold a minimum of five rows of packing and a bronze lantern water ring.
2. Packing shall be die-molded packing rings of material suitable for the intended service and as recommended by the equipment manufacturer.
3. Sealing liquid shall be pumped liquid unless otherwise specified. Taps for external sealing and a lantern ring shall be provided. When used, lantern rings shall be provided with tapped holes to facilitate removal.

2.06 PRESSURE TAPS, TEST PLUGS, AND GAUGES

A. Pressure taps shall be provided on the suction and discharge sides of all pumps, blowers, and compressors. Pressure and vacuum test plugs and gauges shall be provided where specified.

2.07 NAMEPLATES

A. Nameplates shall be provided on each item of equipment and shall contain the specified equipment name or abbreviation and equipment number. Equipment nameplates shall be engraved or stamped stainless steel and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins.

2.08 LUBRICANTS

A. Equipment shall be furnished with proper lubricants in sufficient quantities to allow for the startup and testing period. The type of lubricant shall be as recommended by the equipment manufacturer. Lubricants shall be listed in a complete form either within or separated from the equipment maintenance manual, including a current MSDS. Each lubricant shall be reference to an equipment number that associated with the equipment supplied.

B. With the equipment manufacturer's approval, the Contractor shall minimize the number of different types and brands of lubricants by consolidating the lubricants into the least number of different types required to adequately service the equipment. Not less than 90 days before the date indicated for starting, testing, and adjusting equipment, the Contractor shall provide the Owner with five (5) copies of a list indicating the required lubricants, after consolidation, for each item of equipment. The list shall show estimated quantity of lubricant needed for a full year's operation, assuming continuous operation.

2.09 NOISE REQUIREMENTS AND CONTROLS

A. Unless otherwise specified, the maximum permissible noise level for a complete piece of equipment shall not exceed 85 dbA at 3 feet. A complete piece of equipment includes the driver and driven equipment plus intermediate couplings, gears and auxiliaries.

PART 3 : EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Equipment shall be installed in accordance with the equipment manufacturer's written installation instructions and the requirements of these specifications. The Contractor shall provide and pay for the services of a manufacturer's service engineer to review the installation and make final adjustments to the equipment unless the specifications specifically state that such services are not required.

B. Attention shall be given to design loadings of floors to assure that design loadings are not exceeded during installation of equipment. The Contractor shall be responsible for devising and maintaining installation procedures and techniques which will not overstress structural components.

C. The Contractor shall cover openings in equipment prior to, during and following installation to prevent debris or liquids from entering.

D. Equipment shall not be subject to electrical or mechanical shock. Damaged, dented, or marred equipment shall be replaced or repaired in a manner satisfactory to the Owner, at the option of the Owner, at no additional cost to the Owner.

E. Miscellaneous materials shall be furnished and installed as required to provide a complete, operable equipment installation. Such miscellaneous materials shall include, but not be limited to, the following:

1. Stainless steel and brass shim stock.
2. Thread lubricants, pipe dope, gasket compounds, and sealers.
3. Nonhazardous solvents and cleaning compounds.
4. Welding rod and other expendable construction materials.
5. Paint for touchup of shop coatings.
6. Cribbing, jacks, slings, rigging, blocking, scaffolding, lifting eyes, and other erection materials.
7. Grout, grout forms and blocking.
8. Bolts, studs, nuts, and gaskets for makeup of connections to the equipment, securing the equipment to its supports, and to replace manhole gaskets damaged or misplaced during storage, inspection, cleaning, filling, or placing into service.

F. Welding shall be performed as required to ensure complete and proper installation of the equipment. The following requirements shall apply:

1. The shielded metallic-arc welding process shall be used.
2. Welders and welder operators shall be certified as qualified by the ANSI, ASME, or AWS codes as applicable.
3. Welding procedures shall be in accordance with the following:
   a. ANSI – Code for Power Piping B31.1
   b. ASME – Boiler and Pressure Vessel Code
   c. AWS – Structural Welding Code D1.1
4. Welding to equipment shall be in accordance with the equipment manufacturer's recommended procedures.

G. Grouting of equipment shall be in accordance with the provisions specified in Division 3 and as may be shown on the Drawings.

H. Cleaning and touchup of equipment shall be performed as follows:

1. Temporary protective coatings and foreign materials shall be completely removed prior to assembly and installation.
2. Shop-applied compounds shall be completely removed.
3. Compressed air shall be used to completely remove foreign materials from equipment components and interconnecting piping.
4. Weld spatter, burrs on cut surfaces, and sharp protrusions shall be removed to the satisfaction of the Engineer.
5. Loose paint shall be removed by sandpaper, wire brush, or paint scraper to the satisfaction of the Engineer.
6. Factory-applied prime coats shall be touched up in the field after installation is complete using touchup paint furnished by the equipment manufacturer.

7. Paint shall be applied by brush or spray and in accordance with the paint manufacturer's recommendations. Paint shall not be applied at temperatures below 50F.

3.02 EQUIPMENT MAINTENANCE PRIOR TO INITIAL OPERATION

A. Mechanical equipment and appurtenances shall be properly oiled and lubricated prior to being operated. The equipment installation shall include furnishing and installing oil, grease, and protective fluids required for initial operation. The Contractor shall record the date, type, and quantity of lubricant and/or oil initially installed. Such records shall be submitted to the Owner prior to initial operation of the equipment.

3.03 PAINTING

A. Equipment shall be painted in accordance with the Drawings, except as specified herein.

B. Equipment with approved factory finish shall not be painted.

C. Electrical equipment, as listed below, with standard factory-applied enamel coating systems shall not be painted:

1. Panel boards
2. Electrical panels
3. Switchboards
4. Switchgear
5. Safety switches
6. Motor starter equipment
7. Motor control centers
8. Raceways and cable trays
9. Transformers
10. Power circuit breakers

3.04 SPARE PARTS STORAGE AND MARKING

A. Spare parts shall be wrapped in weatherproof material and packed in painted wooden boxes with hinged cover and hasp lock. Each box shall be clearly labeled on the front and top as to its contents. No box shall weigh more than 150 pounds when full.

3.05 STARTUP AND TESTING

A. Preoperational checkout, operational testing and startup shall be performed in accordance with Section 01 91 10 - Facility Startup and Testing, and as may be specified for each equipment item.

3.06 CONTINUING ADJUSTMENTS

A. The Contractor shall provide such continuing adjustments as are necessary to insure proper operation of equipment after occupancy of the project and for a period of one year after Date of Substantial Completion.

3.07 TRAINING

A. The Contractor shall provide and pay for the services of qualified representatives of the equipment manufacturers to instruct the Owner's personnel in the proper operation and maintenance of the equipment. Instruction time shall be as specified in Section 01 91 11 - Facility Training. Instruction time shall be in addition to, and shall not be done simultaneously with, equipment startup and acceptance testing.

END OF SECTION 11 00 10

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SECTION 11 31 21
PRE-ENGINEERED METAL BUILDING

PART 1 : GENERAL

1.01 SUMMARY

A. Scope:

1. This Section specifies pre-engineered and shop fabricated structural steel building, including the building frame, walls, and sloped roof systems, and including associated accessories, as required for the building.

B. Type:

1. The building supplied under this specification shall be of the clear span, crossed braced, rigid-frame or truss-frame type, with the dimensions and clearances as shown on the drawings. Primary framing shall include rafter beams and columns, end-wall columns and wind bracing. Secondary framing shall include purlins, girts, eave struts, flange bracing, clips, and all other items detailed or required by the metal building manufacturer. Wall and roof sections shall be of preformed metal panels with subgirt framing/anchorage assembly and accessory components as specified by the metal building manufacturer. Walls shall be designed to carry the equipment shown on the drawings.

1.02 REFERENCES

A. This Section contains references to the following documents. Use the current approved standard of these documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

B. American Institute of Steel Construction (AISC):

1. 360 Specification for Structural Steel Buildings
2. 341 AISC Seismic Provisions for Structural Steel Buildings
3. 303 Code of Standard Practice for Steel Buildings and Bridges

C. American Iron and Steel Institute (AISI):

1. S100 North American Specification for the Design of Cold-Formed Steel Structural Members

D. American Welding Society (AWS)

1. D1.1/D1.1M Structural Welding Code
2. D1.3/D1.3M Structural Welding Code

E. ASTM International (ASTM): Latest versions of:

1.	A36/A 36M	Standard Specification for Carbon Structural Steel
2.	A475	Standard Specification for Zinc-Coated Steel Wire Strand
3.	A500/A 500M	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
4.	A529/A 529M	Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
5.	A563 - Standard Specification for Carbon and Alloy Steel Nuts	
6.	A572/A 572M	Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
7.	A653/A 653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
8.	A792/A 792M	Standard Specification for Steel Sheet, 55 Percent Aluminum- Zinc Alloy-Coated by Hot-Dip Process
9.	A992/A 992M	Standard Specification for Structural Steel Shapes.
10.	A1011/A 1011M	Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength, Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
11.	A1018/A 1018A	Standard Specification for Steel, Sheet and Strip, Heavy- Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
12.	C518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
13.	C1363	Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
14.	D635	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
15.	D1003	Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics
16.	D1494	Standard Test Method for Diffuse Light Transmission Factor of Reinforced Plastics Panels
17.	D1929	Standard Test Method for Determining Ignition Temperature of Plastics

18.	D2240	Standard Test Method for Rubber Property—Durometer Hardness
19.	D2244	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
20.	D4214	Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
21.	E84	Standard Test Method for Surface Burning Characteristics of Building Materials
22.	E72	Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
23.	E283	Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across Specimen
24.	E331	Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
25.	E1592	Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
26.	E1646	Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
27.	E1680	Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems
28.	E1980	Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
29.	F436	Standard Specification for Hardened Steel Washers
30.	F1941	Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
31.	F3125	Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

1.03 DESIGN CRITERIA

A. Members shall be designed to withstand building component dead loads and other live, seismic, and wind loading as specified in the Structural General Notes.

B. Exterior wall and roof system to withstand imposed loads with maximum allowable deflection of span 1/180. Provide drainage to exterior for water entering or condensation occurring within cladding system. Assembly to permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subjected to temperature range of 90 degrees F.

C. Buildings shall be designed to support mechanical and electrical equipment as specified on the drawings. Contractor to provide structural members as required to support weights and to provide seismic bracing for mechanical equipment, ductwork, pipes, and electrical conduit.

1.04 SUBMITTALS

A. The following information shall be submitted in the form of shop drawings in accordance with Section 01 33 00 - Submittals:

1. Profiles, sizes, spacing, and locations of structural members, connections, attachments, openings, fasteners, cambers, and loads.
2. Welded connections using standard AWS welding symbols. Indicate net weld lengths.
3. Framing anchor bolt settings, sizes, and locations from datum.
4. Shop drawings under seal of a professional structural engineer registered in the State of Washington.
5. Structural calculations under seal of a professional structural engineer registered in the State of Washington.
6. Wall and roof system dimensions, panel layout, general construction details, anchorages, and method of anchorage of installation.
7. Support details for wall-mounted equipment and pipe supports.
8. Roof equipment support details.
9. Manufacturer's installation instructions.
10. Samples of wall and roof panels with specified color for the project.

PART 2 : PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. The building supplied shall be manufactured by Armco Building Systems, Butler Metal Building Systems, Braden Metal Building Systems, Kirby Metal Building Systems, or equal.

2.02 MATERIALS

A. Primary Framing Steel:

1. Hot-rolled shapes: ASTM A36 or ASTM A992, minimum yield of 36 ksi (248 MPa) or 50 ksi (345 MPa).

2. Round tube: ASTM A500, Grade B or C with minimum yield strength of 42 ksi (290 MPa).
3. Square and rectangular tube: ASTM A500, Grade B or C, minimum yield strength of 42 ksi (290 MPa).
4. Cold-formed C sections: ASTM A1011, Grade 55 (380), or ASTM A653, Grade 55 (380).
5. X-bracing: ASTM A529 or A572 for rod bracing 36 ksi (248 MPa) or 50 ksi (345 MPa), ASTM A36 for angle bracing or ASTM A475 for cable bracing.

B. Secondary Framing Steel:

1. Purlins, girts, and eave struts: ASTM A1011 Grade 55 or ASTM A653, Grade 55.
2. Thickness:
   a. 14 gauge: 0.067 inch (1.689 mm) minimum uncoated thickness.
3. Finish: G-90 Pre-galvanized Shop Coat. Shop coat only intended to provide temporary protection during transportation and erection.

C. Panels:

1. Materials: ASTM A792.
2. Thickness and yield strength:
   a. 24 gauge: 0.0212 inch (0.538 mm) minimum uncoated thickness, 50 ksi yield strength.
3. Finishes:
   a. Galvalume: Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A792 AZ55.
   b. Galvalume® Plus: Acrylic-Coated Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A792 AZ55 with acrylic finish with no added lubricant.
   c. Exterior Paint:
      1) Fluoropolymer Two-Coat System (PVDF): 0.2 – 0.3 mil primer with 0.7 -0.8 mil 70 percent PVDF fluoropolymer color coat. Basis of Design: Signature 300.
   d. Interior Paint: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.
4. Fasteners:
   a. Through-fastened panels: Self-drilling with sealing washer.
   b. Standing seam panels: Long life self-drilling with sealing washer.
   c. Ridge: Long-life self-drilling with sealing washer.
   d. Clips to purlin or bar joists: Long-life self-drilling with hex washer head and washer.

5. Clips:
    a. Low or high fixed clips: Use where moderate thermal expansion and contraction in roof panel is expected.
    b. Low or high sliding clips: Provide 2 to 4 inches of travel for panel thermal expansion and contraction.
6. Sealants and Closures:
    a. Side-laps: Factory applied, hot melt, foamable mastic.
    b. End-laps, eave, ridge assembly, gable flashings: Field-applied sealant, Sika Sikaflex -1A or equivalent.
    c. Standing Seam Roof Closures:
        1) Outside closures: 24 gauge steel sheet.
        2) Inside closures: 18 gauge Galvalume or G-40 galvanized coated steel complying with ASTM A653/A653M.
    d. Through-Fastened Roof Closures: Provide closed-cell polyethylene inside foam closures.
        1) Bulk Density: 2 pounds per cubic foot.
        2) Service Temperature: -100 to 180 degrees Fahrenheit.
        3) Shore Hardness: 7 on AA scale or 51 on 00 scale when tested to ASTM D2240.

2.03 PRIMARY FRAMING

A. Frame Design: As indicated on Drawings.

B. Bracing: Standard X-Bracing or Portal Frames as determined by the vendor's design.

2.04 SECONDARY FRAMING

A. Roof Zee Purlins:

1. Horizontal structural members which support roof coverings.
2. Depth: As required by design, 8 inch minimum.
3. Thickness: As required by design, 16 gauge minimum.
4. Finish: shop coat. Shop coat only intended to provide temporary protection during transportation and erection.

B. Wall Zee Girts:

1. Horizontal structural members that support vertical panels.
2. Depth: As required by design, 8 inch minimum.
3. Gauge: As required by design, 16 gauge minimum uncoated thickness).
4. Finish: shop coat. Shop coat only intended to provide temporary protection during transportation and erection.

C. Spandrel Beams: ASTM A36/A36M or ASTM A992/A992M wide flange shapes, minimum yield 50 ksi for support of wall systems provided by others, as required by design.

2.05 BOLTS

A. Primary Frame Connections: Provide High Strength Bolts, Nuts and Washers:

1. Bolts: ASTM F3125 Grade A325 Heavy Hex Structural Type I.
2. Washers: ASTM F436 Type 1 Hardened Steel.
3. Nuts: ASTM A563 Grade C Heavy Hex. Nuts shall be wax coated by emulsion such that the torque required to complete a Rotational Capacity (RC) test shall be reduced by 40% from the un-waxed state.
4. Coating: Hot-Dipped Galvanized.

B. Other Connections: Provide High Strength or Machine Bolts as required by manufacturer design:

1. High Strength Bolts and Nuts:
   a. Bolts: ASTM F3125 Grade A325 Heavy Hex Structural Type I.
   b. Nuts: ASTM A563 Grade C Heavy Hex.
   c. Coating: ASTM F1941 Electrodeposited Yellow Zinc.
2. Machine Bolts:
   a. Bolts: ASTM A307 Grade Carbon Steel.
   b. Nuts: ASTM A563 Grade A Hex Nut.
   c. Coating: ASTM F1941 Electrodeposited Clear Zinc.

2.06 ROOF SYSTEMS

A. Assembly Performance Requirements: Provide roof products and assemblies meeting the following requirements:

1. Class 90 rated and listed in accordance with UL-580 for Wind Uplift.
2. Class 4 rated and listed in accordance with UL-2218 for Impact Resistance.

B. Standing Seam Panels:

1. Type: Single skin panels with concealed clips.
2. Panel Strength: Determine and certify panel strength as follows:
   a. Positive Loading (Toward Panel Supports): Determine in accordance with AISI S100.
   b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E1592.

3. Panel profile: Double-Lok:
    a. Panel Type: Trapezoidal machine seamed, 1/4:12 minimum roof slope.
    b. Panel width: 12 inches wide x 3 inches high (305 mm wide x 76 mm high).
    c. Thickness: 22 gaugemin.
    d. Finish:PVDF.
    e. Color: Selected by Owner from manufacturer standard colors.
    f. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E1680 at a pressure differential of +/- 1.57 psf.
    g. Water Infiltration: No uncontrollable water leakage when tested to ASTM E1646 at a 20 psf (955 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.

C. Accessories
1. Pipe flashing: As specified by roof and wall panel manufacturers.
2. Eave trim condition: Standard gutters and downspouts.

D. Through-Fastened Panels:
1. Panel type: Single skin ribbed panels with exposed fasteners.
2. Panel strength: Determine in accordance with AISI S100.
3. Panel profiles:
    a. PBR: 12 x 1 inch (305 mm x 25 mm) Rib. 1-1/4 inch (32 mm) ribs x 12 inch (305 mm) centers).
4. Thickness:24 gauge min.
5. Finish: Galvalume® Plus.
6. Color: Selected by owner from manufacturer standard colors.
7. Panel fasteners:Stainless steel.

2.07 GUTTER AND DOWNSPOUTS

A. Gutters and downspouts shall be fabricated of the same material and finish as roofing metal. Gutters, downspouts, and scuppers shall be of standard profile and dimensions to collect and remove water. Gutters, downspouts, and scuppers shall be fabricated using maximum lengths possible, and connection pieces between lengths. Joints shall be designed to allow for expansion and contraction. All exposed edges shall be hemmed. Support straps shall be 1/4 inch (min) x 2 inch steel straps at 36 inch spacing (min).

PART 3 : EXECUTION

3.01 FRAMING ERECTION

A. Temporary bracing shall be provided to maintain structure plumb and alignment until completion of erection and installation of permanent bracing. Temporary bracing shall be designed to accommodate wind loads. Column base plates shall be set with nonshrink grout to full plate bearing. Structural members shall not be field cut or altered in any way without approval of the Construction Manager.

3.02 WALL AND ROOFING SYSTEMS

A. All components of the wall and roofing system shall be installed per manufacturer's recommendation. Cladding systems shall be aligned level and plumb and fastened to the structural supports. End laps shall be located over supports, with end lap panels having a minimum width of 2 inches. Sidelaps shall be placed over bearing. Expansion joints shall be installed where indicated or required. All fasteners shall be concealed. Sealant and gaskets shall be used to prevent weather penetration. The building system shall be free of rattles and noise due to thermal movement and wind. All cuttings shall be removed from finished surfaces.

3.03 TOLERANCES

A. Framing Members:

1. All framing members shall be installed within 1/4 inch from level and 1/8 inch from plumb.

B. Siding and Roofing:

1. All siding and roofing panels shall be installed within 1/8 inch of true position.

3.04 INSTALLATION OF ACCESSORIES

A. All doors and associated frames shall be installed in accordance with the manufacturer's recommendations. All penetrations shall be sealed watertight.

3.05 GUTTER AND DOWNSPOUT ERECTION

A. Gutters and downspouts shall be rigidly and securely supported. Lengths shall be joined with formed seams and sealed watertight. Joints between gutters and downspouts shall be flashed and sealed. All metal surfaces in contact with cementitious surfaces shall be coated with bituminous paint. All gutters shall be sloped a minimum 1/8 inch per foot.

END OF SECTION 11 31 21

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SECTION 13 53 00
SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

PART 1 : GENERAL

1.01 SUMMARY

A. The Contractor shall design, furnish, and install seismic restraints in accordance with the requirements of this Section in order to maintain the integrity of nonstructural components attached to structures so that they remain safe and functional in case of seismic event.

B. Non-structural components are components or systems that are not part of the structure's primary load resisting system whether inside, outside, above grade or below grade. Non-structural components include but are not limited to the following:

1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements; cornices and other architectural projections and parapets that do not function structurally; glazing; nonbearing partitions; suspended ceilings; stairs isolated from the basic structure; cabinets; bookshelves; testing equipment; and storage racks.
2. Electrical Elements: Power and lighting systems; substations; switchgear and switchboards; auxiliary engine-generator sets; transfer switches; motor control centers; motor generators; selector and controller panels; fire protection and alarm systems; special life support systems; telephone and communication systems; raceways; and cable trays.
3. Mechanical Elements: Heating, ventilation, and air-conditioning systems; plumbing systems; sprinkler systems; pneumatic systems; boiler equipment and components, blowers and components, process piping and appurtenances, tanks, and valves; boiler plant stacks and breaching.
4. Transportation Elements: Mechanical, electrical and structural elements for transport systems; i.e., cranes and conveyers.

1.02 REFERENCES

A. ACI Standards:

1. 355.2 Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary

B. ASTM Standards:

1. E488 Standard Test Methods for Strength of Anchors in Concrete Elements

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Submit a coordinated set of equipment anchorage drawings prior to installation including:
    a. Description, layout, and location of items to be anchored or braced with anchorage or brace points as noted and dimensioned.
    b. Details of anchorage or bracing at large scale with all members, parts and brackets shown, together with all connections, bolts, welds, etc. clearly identified and specified.
    c. Numerical value of design seismic brace loads.
    d. For expansion bolts, include design load and capacity if different from those specified.
2. Submit prior to installation, a coordinated set of bracing drawings for seismic protection of piping, with data identifying various support-to-structure connections and seismic bracing structural connections, including:
    a. Single-line piping diagrams. Show all suspended piping for a given floor on the same plane.
    b. Type of pipe (copper, steel, cast iron, insulated, non-insulated, etc.).
    c. Pipe contents.
    d. Structural framing.
    e. Location of all gravity load pipe supports and spacing requirements.
    f. Numerical value of gravity load reactions.
    g. Location of all seismic bracing.
    h. Numerical value of applied seismic brace loads.
    i. Type of connection (Vertical support, vertical support with seismic brace etc.).
    j. Seismic brace reaction type (tension or compression). Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.
3. Submit prior to installation, bracing drawings for seismic protection of suspended ductwork and suspended electrical and communication cables, include:
    a. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.
    b. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.

c. Maximum spacing of hangers and bracing.

4. Submit design calculations prepared and stamped and signed by the licensed structural engineer specified above in Paragraph 1.02.A. Calculations shall document applicable reference standards used for the design.

5. Submit for concrete anchors, the appropriate ICC or other certification agency evaluation reports, or lab test reports verifying compliance.

6. Submit catalog data for manufactured fasteners, struts, clips, and other bracing hardware with load capacity certifications.

7. Submit manufacturer's certifications in conformance with ASCE-7 Section 13.

1.04 QUALITY ASSURANCE

A. Design:

1. Seismic-force-restraint shop drawings and calculations shall be prepared by a professional structural engineer licensed to practice as in the State of Washington and experienced in the area of seismic force restraints. The structural engineer shall be hired by and paid for by the Contractor.

2. Shop drawings, calculations, and detail schedules shall be stamped and signed by the licensed structural engineer.

B. Coordinate details of seismic restraints with equipment and structure details.

1.05 DESIGN CRITERIA

A. Building Code:

1. Building Code: The Building Code is the 2021 International Building Code, including ASCE 7 and reference standards therein, as adopted and amended by the City of Everett.

2. ASCE 7: Minimum Design Loads for Buildings and Other Structures, ASCE Standard 7-10, as amended by the Building Code.

B. Design of seismic restraints shall conform to the Building Code. Use the following values in the design calculations:

1. Ip (component importance factor) = 1.5

2. SDS (design spectral acceleration for short periods) = 0.804

3. Seismic Design Category: D.

C. Exceptions: The seismic restraint of the following items may be omitted:

1. Equipment weighing less than 400 pounds, which is supported directly on the floor or roof.

2. Equipment weighing less than 20 pounds, which is suspended from the roof or floor or hung from a wall.
3. Gas piping less than 2½ inches inside diameter.
4. Piping in wet well and equipment rooms less than 1¼ inches inside diameter.
5. All other piping less than 2½ inches inside diameter, except for automatic fire suppression systems.
6. All piping suspended by individual hangers, 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
7. All electrical conduits, less than 2½ inches inside diameter.
8. All rectangular air handling ducts less than six square feet in cross sectional area.
9. All round air handling ducts less than 28 inches in diameter.
10. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of support for the hanger.

PART 2 : PRODUCTS

2.01 COMPONENT ATTACHMENTS

A. Component bracing shall be constructed of painted or hot-dipped galvanized carbon steel, or of stainless steel where indicated on the plans. Fasteners shall be carbon steel or stainless steel.

PART 3 : EXECUTION

3.01 CONSTRUCTION, GENERAL

A. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.

B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.

C. Construct seismic restraints and anchorage to allow for thermal expansion.

D. Brace duct and breeching branches with a minimum of 1 brace per branch.

E. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment or building members.

F. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

G. Testing Before Final Inspection:

1. Test 10-percent of anchors in masonry and concrete per ASTM E488, and ACI 355.2 to determine that they meet the required load capacity. If any anchor fails to meet the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10-percent testing frequency.
2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor loads were obtained.

3.02 CEILINGS AND LIGHTING FIXTURES

A. At regular intervals, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.

B. Independently support and laterally brace all lighting fixtures. Refer to applicable portion of lighting specifications.

3.03 STORAGE RACKS, AND CABINETS

A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.

B. Anchor supply cabinets to the floor or walls and equip them with properly engaged, lockable latches.

END OF SECTION 13 53 00

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SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 : GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this section.

1.02 SCOPE OF WORK – GENERAL

A. This section specifies general requirements for HVAC installations and includes requirements common to more than one section of Division 23. It expands and supplements the requirements specified in sections of Division 01.

B. Provide materials, labor, transportation, tools, permits, fees, inspections, utilities, and incidentals necessary for the complete installation of HVAC work indicated and described in the Contract Documents.

C. It is the intent of the Contract Documents to provide an installation complete in every respect. If additional details or special construction is required for work indicated or specified under this section of work or work specified in other sections, provide material and equipment which is usually furnished with such systems to complete the installation, whether mentioned or not.

1.03 CODES AND STANDARDS

A. Code Compliance: Comply with most current edition adopted by the Authority Having Jurisdiction of the following:

B. Washington State Energy Code, Commercial Provisions.

C. Applicable State and local codes, laws, and ordinances.

1.04 SEQUENCE OF WORK

A. Conduct work in sequence to provide least interference to the activities of the Owner, and to permit orderly transfer of activities and equipment to completed areas.

B. Work shall be substantially complete by the dates listed in Division 01 Section “Summary.”

1.05 DEFINITIONS

A. Provide: Furnish and install complete and ready for intended use.

B. Indicated: Indicated on drawings.

C. Noted: Noted on Drawings or in Specifications.

D. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

E. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

F. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

G. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

H. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.06 SAFETY OF PERSONS AND PROPERTY

A. Comply with applicable laws, ordinances, rules, and regulations of any public authority for the safety of persons and property, including requirements of the Washington Department of Safety and Health (DOSH) or the Occupational Safety and Health Act (OSHA) whichever is most stringent, and Section 00 72 00 – General Conditions.

1.07 PERMITS AND FEES

A. Obtain and pay for required permits and fees necessary to fully complete work included in the Contract Documents.

1.08 INTENT AND INTERPRETATION

A. Drawings and Specifications supplement each other, and any details contained in one and not the other shall be included as if contained in both. Items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation shall be included.

B. Drawings are partly diagrammatic and do not necessarily show the exact location of new piping and existing utilities, unless specifically dimensioned.

C. Riser and other diagrams are schematic only and do not necessarily show the physical arrangement of equipment. They shall not be used for obtaining quantities or linear runs of piping.

D. Grilles, fixtures, or other pieces of equipment shall be centered on windows, wall spaces, or other items, unless specifically dimensioned otherwise.

E. Location of piping and ductwork shall be checked to determine that it clears openings and structural members; that it may be properly concealed; and that it clears cabinets, lights and equipment having fixed locations.

F. HVAC drawings shall serve as working drawings for Division 23 work. Refer to Architectural, Structural, and Electrical drawings for additional detail affecting the installation of work. The Architectural drawings shall take precedence over the HVAC drawings if any dimensional discrepancies exist.

G. The approximate location of each item is indicated on the drawings. These drawings are not intended to give complete and exact details regarding location. Exact locations are to be determined by actual measurements at the building. Not all pipe and duct offsets are indicated on the drawings.

1.09 SUBMITTAL OF EQUIPMENT FOR APPROVAL

A. Refer to Section 01 33 00 – Submittals for submittal definitions, requirements, and procedures. Additional requirements are listed below.

B. Shop drawings, catalog information, and material schedules shall be submitted for approval on materials and equipment prior to ordering.

C. Submittals not meeting the following requirements will be returned for revision:

1. Provide a cover page for each item or group of items (schedule group, single fixture plus trim group, etc.).
2. Each cover page must be clearly identified with the project name, specification number, and paragraph number.
3. The submittal package must be accompanied by an itemized index listing specification section, paragraph number, item, and manufacturer; larger projects will be index tabbed by specification section with index for each section.

1.10 GUARANTEE

A. Guarantee satisfactory operation of material and equipment installed under Division 23. Repair or replace any defective materials, equipment, or workmanship which may show itself within one year from the date of Substantial Completion.

PART 2 : PRODUCTS

2.01 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

A. Where more than one manufacturer is listed, provide products of only one manufacturer for each type of product.

B. Materials used under this Contract, unless specifically noted otherwise, shall be new and of the latest and most current model line produced by the manufacturer. Outdated “new” equipment is not acceptable.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2.02 EQUIPMENT AND MATERIAL SUBSTITUTIONS

A. Throughout these Contract Documents, various materials, equipment, apparatus, etc., are specified by manufacturer, brand name, type, or catalog number. Such designation is to establish standards of desired quality and construction, and shall be the basis of the bid.

B. Where more than one manufacturer is listed, and only one manufacturer’s catalog number is indicated, that standard of quality and construction shall be maintained by materials supplied by other manufacturer(s).

C. No substitutions.

D. The Contractor shall bear full responsibility for substituted equipment and materials, including, but not limited to:

1. Costs.
2. Available space requirements.
3. Effect on other trades.
4. Changes in electrical requirements.
5. Changes in structural requirements.

PART 3 : EXECUTION

3.01 COMMISSIONING

A. At a minimum, comply with the requirements of the Washington State Energy Code.

3.02 COORDINATION

A. Refer to Section 01 32 11 – Construction Constraints and Sequences.

B. Coordinate available space for equipment and systems with other trades. Refer to Architectural, Structural and Electrical Drawings for additional building details necessary for coordination.

C. Cutting, patching, wiring, finishing or any other work required for relocation of work installed due to interferences between the work of the various trades will be at no additional cost to the Owner.

3.03 MANUFACTURER'S INSTRUCTIONS

A. Furnish proper equipment and/or materials required for installation as intended by the manufacturer, for all work described under Division 23. If needed for proper installation or operation, request advice and supervisory assistance from the representative of the specific manufacturer. Manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufactured materials or equipment, unless otherwise indicated. Promptly notify the Engineer in writing of any conflict between the requirements of the Contract Documents and the manufacturer's directions and obtain the Engineer's instructions before proceeding with the work.

3.04 EXAMINATION OF SITE

A. Visit site of proposed work and become familiar with conditions affecting work. Verify measurements at the building before beginning work.

3.05 LAYING OUT WORK

A. Locations of equipment and devices, as shown on the drawings, are approximate unless dimensioned. Exact locations of such items shall be determined from the Construction Drawings. Verify physical dimensions of each item of mechanical equipment, ductwork system and piping system, to fit available space and promptly notify the Engineer prior to roughing-in if conflicts appear. Coordinate equipment to available space and access routes through construction. Offsets or transitions in ductwork or piping systems required for proper system operation and/or installation, whether indicated on drawings or not, shall be provided at no additional cost to Owner.

3.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Store equipment and materials at the site unless offsite storage is authorized in writing. Protect stored equipment and materials from damage.

C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

3.07 ACCESSIBILITY

A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate location of concealed equipment and devices requiring access with location of access panels and doors. Allow ample space for removal of parts that require replacement or servicing.

3.08 TEMPORARY USE OF NEW EQUIPMENT

A. New equipment shall not be used for temporary heating, cooling, or ventilation unless authorized in writing by the Owner.

3.09 CUTTING AND PATCHING

A. Cutting shall be performed with masonry saws, core drills or similar equipment to provide neat and uniform openings.

B. Patching shall match adjacent surfaces in materials and finish. Do not endanger or damage installed work through procedures and processes of cutting and patching.

C. Arrange for repairs required to restore other work, which was damaged because of mechanical installations. Upon receipt of written authorization from Engineer, Contractor will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.

D. No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.

E. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. Uncover work to provide for installation of ill-timed work.
2. Remove and replace defective work.
3. Remove and replace work not conforming to requirements of the Contract Documents.
4. Remove samples of installed work as specified for testing.
5. Install equipment and materials in existing structures.
6. Upon written instructions from the Engineer, uncover and restore work to provide for observation of concealed work.

F. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including, but not limited to removal of mechanical piping, heating units, and other mechanical items made obsolete by new work.

G. Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

H. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

END OF SECTION 23 05 00

SECTION 23 05 05
PROJECT CLOSEOUT FOR HVAC

PART 1 : GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this section.

1.02 SCOPE OF WORK – GENERAL

A. This section specifies procedural requirements for HVAC installations project closeout, including but not limited to:

1. Project Record Documents submittal.
2. Operation and Maintenance (O&M) Manual submittal.
3. Operation and maintenance instruction and training.
4. HVAC equipment and systems startup.
5. Final cleaning.
6. Owner training session agenda.

B. Related Sections include the following:

1. Section 01 33 00 – Submittal Procedures.
2. Section 01 77 00 – Closeout Procedures.
3. Section 01 91 11 – Facility Training.

1.03 PROJECT RECORD DOCUMENTS

A. Record the differences between the HVAC work as installed and as shown in the Contract Drawings on a set of prints of HVAC drawings furnished by the Engineer. Return these prints to the Engineer at the completion of project. Notations made on drawings shall be neat and legible. Comply with Division 01 requirements.

B. Mark drawings to indicate revisions to HVAC piping and ductwork, size and location both exterior and interior; including locations of coils, dampers, and other control devices, filters, motors and similar items requiring periodic maintenance; actual equipment locations; concealed equipment and control devices; mains and branches of piping systems, with valves and control devices located and numbered.

C. Revise the equipment and fixture schedules on the Drawings to indicate actual installed manufacturer and model numbers.

D. Mark specifications to indicate change orders; actual equipment and materials used.

1.04 OPERATION AND MAINTENANCE MANUALS

A. Prepare and submit Operation and Maintenance (O&M) Manuals for HVAC systems provided. Comply with Division 01 Section requirements.

B. Provide primary index at beginning of Manual showing sections and items included.

C. Cover section: List name, address, and phone number of Project Engineer, General Contractor, Mechanical Engineer, HVAC Contractor, and all HVAC Subcontractors. Provide a list of equipment suppliers with address and phone number.

D. Provide a separate section for each Section of the Specifications. Provide an index for each section listing equipment included. Include all items specified.

E. Include descriptive literature (manufacturer's catalog data) of each manufactured item. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined. Data sheets shall be originals or clean copies of originals.

F. One (1) draft copy of the manual shall be submitted for review, comment, and approval, as applicable, at least 15 days prior to substantial completion or training, whichever is first. After approval, submit three (3) copies of the manual to the Engineer for approval unless otherwise directed by Section 01 77 00 – Closeout Procedures requirements. Information to be included in manual:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
2. Manufacturer's printed operating procedures to include startup, break-in, routine, and normal operating instructions; regulation, control, stopping shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.
5. Schematic control diagrams for each automatic control system. Mark the correct operating setting for each control instrument on these diagrams.
6. Testing, Adjusting, and Balancing Report.
7. Test records and certifications.
8. Equipment startup reports.
9. Warranty information and letters of guarantee.
10. Instruction period checklist for each equipment item.

G. Complete O&M Manual shall be available for use by Owner's representatives during instruction and training sessions.

1.05 OPERATION AND MAINTENANCE INSTRUCTION AND TRAINING

A. Instruct Owner's Representative(s) in the Operation and Maintenance procedures described in Operation and Maintenance Manual. Comply with Section 01 91 11 – Facility Training requirements.

B. Enlist the services of qualified personnel, including each sub-trade and factory trained specialists for each major piece of equipment, to attend training sessions and provide operation and maintenance instructions.

C. Submit training agenda, schedule, and list of representatives for review 30 days prior to training sessions. Confirm attendance by written notification to all participants.

D. Prepare a checklist of all equipment and systems requiring instruction and maintenance for verification and agreement by the Owner's Representative of satisfactory startup and instruction. The checklist shall include a statement of completion by the Contractor, date and topic(s) covered in each training session, and an attendance list of all participants at each training session. Submit a copy of checklist for review 30 days prior to training sessions. Include copy of the completed checklist in Operation and Maintenance Manual.

E. Refer to individual Division 23 Sections for additional instruction/training requirements.

F. All HVAC systems shall be properly functioning prior to instruction period.

PART 2 : PRODUCTS (NOT USED)

PART 3 : EXECUTION

3.01 HVAC EQUIPMENT AND SYSTEMS STARTUP

A. Provide the services of a factory-authorized service representative to test and inspect unit installation, provide startup service, and demonstrate and train Owner's maintenance personnel.

B. Include certification of factory-authorized representative status as part of equipment submittal from manufacturer. Include copies of any installation and startup instructions, manufacturer's checklists, and other forms used in startup as part of the equipment submittal.

C. Include written startup reports with test data for equipment in Operation and Maintenance Manual.

D. All construction debris, including electrical wiring debris shall be removed from units prior to equipment startup. Areas surrounding and served by equipment being started must be free of construction debris, sheetrock dust, and any materials that may adversely affect the equipment.

3.02 FINAL CLEANING

A. Refer to Division 01 general requirements for final cleaning.

B. At time of final cleanup, clean all fixtures and equipment, and leave in condition for use intended. Vacuum cabinet interiors of control panels, air handling units, etc. to remove all construction debris including electrical wiring debris.

END OF SECTION 23 05 05

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SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 : GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 REFERENCE STANDARDS

A. The publications listed below form a part of this Specification to the extent referenced. References and standards listed herein are to be the latest edition available, unless specifically stated otherwise.

1. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
4. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
5. ASTM E96/E96M – Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
6. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. See Section 23 05 00 – Common Work Results for HVAC for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

PART 2 : PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Steel Components: Use corrosion-resistant materials suitable for the environment where installed.
    a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Prefabricated Trapeze-Framed Metal Strut Systems:

1. Strut Channel or Bracket Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
2. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, J-hooks, protectors, and vibration dampeners.

C. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.
2. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: ½ inch diameter.
    b. Piping up to 1 inch: ¼ inch diameter.
    c. Piping larger than 1 inch: ⅜ inch diameter.

D. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by the Engineer, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by the Engineer, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

G. Secure fasteners according to manufacturer's recommended torque settings.

END OF SECTION 23 05 29

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SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 : GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

1.02 REFERENCE STANDARDS

A. The publications listed below form a part of this Specification to the extent referenced. References and standards listed herein are to be the latest edition available, unless specifically stated otherwise.

1. ASTM D709 – Standard Specification for Laminated Thermosetting Materials.

1.03 SUBMITTALS

A. See Section 23 05 00 – Common Work Results for HVAC for submittal procedures.

PART 2 : PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Piping: Pipe markers.

2.02 NAMEPLATES

A. Letter Color: White.

B. Letter Height: ¼ inch.

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion-resistant chain.

END OF SECTION 23 05 53

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SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 : GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

1.02 REFERENCE STANDARDS

A. The publications listed below form a part of this Specification to the extent referenced. References and standards listed herein are to be the latest edition available, unless specifically stated otherwise.

1. AABC (NSTSB) – AABC National Standards for Total System Balance, 7th Edition.
2. ASHRAE Std 111 – Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.
3. ASTM C1060 – Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings.
4. NEBB (TAB) – Procedural Standard for Testing, Adjusting, and Balancing of Environmental Systems.
5. SMACNA (TAB) – HVAC Systems Testing, Adjusting, and Balancing.
6. Washington State Energy Code Commercial Provisions, latest adopted version.

1.03 SUBMITTALS

A. See Section 23 05 00 – Common Work Results for HVAC for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Include at least the following in the plan:
    a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted, and balanced with the data cells to be gathered for each.
    c. Identification and types of measurement instruments to be used and their most recent calibration date.
    d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    e. Final test report forms to be used.

f. Procedures for formal deficiency reports, including scope, frequency, and distribution.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 : PRODUCTS (NOT USED)

PART 3 : EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. AABC (NSTSB).
2. ASHRAE Std 111.
3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section independent of the installing contractors or equipment suppliers for this project.
2. Having minimum of five years documented experience of projects of similar scope and complexity.
3. Certified by one of the following:
   a. AABC, Associated Air Balance Council; upon completion, submit AABC National Performance Guaranty.
   b. NEBB, National Environmental Balancing Bureau.
   c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

E. Pre-Qualified TAB Agencies:

1. Neudorfer Engineers.

2. AirTest Inc.
3. United Test & Balance.
4. TAC Systems.
5. Hardin and Sons.
6. Or approved equal.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
4. Duct systems are clean of debris.
5. Fans are rotating correctly.
6. Air coil fins are cleaned and combed.
7. Access doors are closed and duct end caps are in place.
8. Air outlets are installed and connected.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within ±5% of design for supply systems and ±10% of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within +10% and −5% of design to space. Adjust outlets and inlets in space to within ±10% of design.

3.04 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross-sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50% loading of filters.

3.06 SCOPE

A. Test, adjust, and balance the following:

1. Fans.
2. Air Inlets and Outlets.

3.07 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Sheave Make/Size/Bore.

B. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Airflow specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Fan RPM.

C. Duct Traverses:

1. System zone/branch.
2. Duct size.

3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.

END OF SECTION 23 05 93

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SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 : GENERAL

1.01 SECTION INCLUDES

A. Wall exhausters.

1.02 REFERENCE STANDARDS

A. The publications listed below form a part of this Specification to the extent referenced. References and standards listed herein are to be the latest edition available, unless specifically stated otherwise.

1. AMCA (DIR) – (Directory of) Products Licensed Under AMCA International Certified Ratings Program.
2. AMCA 99 – Standards Handbook.
3. AMCA 204 – Balance Quality and Vibration Levels for Fans.
4. AMCA 210 – Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
5. AMCA 300 – Reverberant Room Method for Sound Testing of Fans.
6. AMCA 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
7. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems.
8. UL 705 – Power Ventilators.

1.03 SUBMITTALS

A. See Section 23 05 00 – Common Work Results for HVAC for submittal procedures.

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.04 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

PART 2 : PRODUCTS

2.01 MANUFACTURERS

A. Greenheck Fan Corporation.

2.02 POWER VENTILATORS – GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing a certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 WALL EXHAUSTERS

A. Manufacturers:

1. Greenheck Fan Corporation.
2. Loren Cook Company.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; ½ inch mesh, 0.062-inch-thick aluminum wire bird screen.

C. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm can be reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION 23 34 23

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 : GENERAL

1.01 SECTION INCLUDES

A. Louvers:

1. Extruded aluminum louvers.

1.02 REFERENCE STANDARDS

A. The publications listed below form a part of this Specification to the extent referenced. References and standards listed herein are to be the latest edition available, unless specifically stated otherwise.

1. AMCA 500-L – Laboratory Methods of Testing Louvers for Rating.
2. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
3. ASTM B221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
4. SMACNA (ASMM) – Architectural Sheet Metal Manual.

1.03 SUBMITTALS

A. See Section 23 05 00 – Common Work Results for HVAC for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 QUALITY ASSURANCE

A. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 : PRODUCTS

2.01 LOUVERS

A. Manufacturers:

1. Greenheck Fan Corporation.
2. Nailor Industries.
3. NCA, a brand of Metal Industries Inc.
4. Pottorff.
5. Ruskin Company.
6. United Enertech.

B. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.

1. Wind Load Resistance: Design to resist positive and negative wind loads of 20 psf without damage or permanent deformation.
2. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

2.02 EXTRUDED ALUMINUM LOUVERS

A. Louvers: Horizontal blade, extruded aluminum construction.

1. Extruded Aluminum: ASTM B221 (ASTM B221M).
2. Pressure Drop: 0.20 inches of water gauge maximum per square foot of free area at velocity of 1000 fpm, when tested in accordance with AMCA 500-L, test unit size 48 inches by 48 inches.
3. Blades: Straight.
4. Frame: Depth as indicated on drawings, channel profile; mitered corner joints.

B. Accessories:

1. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch diameter wire, ½ inch open weave, diagonal design.
2. Fasteners and Anchors: Stainless steel.
3. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
4. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Comply with SMACNA (ASMM) for flashing/counterflashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install louver assembly in accordance with manufacturer’s instructions.

E. Coordinate with installation of flashings by others.

F. Install louvers level and plumb.

G. Set sill members and sill flashing in continuous bead of sealant.

H. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

I. Secure louver frames in openings with concealed fasteners.

3.02 CLOSEOUT ACTIVITIES

A. Demonstrate operational system to Owner’s representative.

B. Instruct Owner's representative to maintain system and use occupant controls or interfaces, as required.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION 23 37 00

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SECTION 26 00 00
GENERAL ELECTRICAL

PART 1 : GENERAL

1.01 SUMMARY

A. This Section specifies general requirements for electrical work. Detailed requirements for specific electrical items are specified in other Sections but are subject to the general requirements of this Section. The electrical drawings and schedules included in this project manual are functional in nature and do not specify exact locations of equipment or equipment terminations.

1.02 DEFINITIONS

A. The word "provide" shall be interpreted to mean furnish and install.

B. “Owner”: City of Everett.

C. “Contractor” is the party who furnishes and installs all materials and equipment. This includes the Prime Contractor, Electrical Contractor, Control System Integrator, and all other Contractors and Sub Contractors.

D. “Control System Integrator” also referred to as the System Integrator or Integrator or control system manufacturer is the Party that furnishes all control components and designs the detailed control wiring diagrams plus the layout and assembly of the custom control panels.

E. “Control System” includes all equipment, instruments, computers and wiring for control and monitoring of all operating pumps and equipment. This includes custom control panels, motor control center, packaged control panels, and control equipment furnished with other systems and mechanical equipment. All sensing, transmitting, indicating, control and recording of all functions as specified and shown are also included in the control system.

1.03 GENERAL DESCRIPTION OF WORK

A. The Contractor shall:

1. Provide all labor, material, tools, equipment, and services required to complete the furnishing, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical equipment, devices and components as indicated and implied by the plans and these specifications.
2. Provide identification (nameplates and wire tags) of all electrical equipment and wiring.
3. Complete the wiring to, connection to, adjustment and calibration of, testing of equipment having electric motors and/or built-in or furnished electrical components. Install electrical components that are furnished with mechanical equipment.

4. Complete the procurement, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical devices, components, accessories, and equipment which is not shown or specified but which is nonetheless required to make the systems shown and specified function properly.
5. Provide the size, type and rating of motor control devices, equipment and wiring necessary to match the ratings of motors furnished with mechanical equipment.
6. Provide adequate space for the electrical installation, including but not limited to, determination of access-ways and doorways, shipping sections, wall and floor space, and space occupied by mechanical equipment. Provide electrical equipment that fits in the areas shown on the drawings. All equipment shall be readily accessible for maintenance, shall have electrical clearances in accordance with NEC and shall be installed in locations that will provide adequate cooling.
7. Provide detailed wiring diagrams showing all equipment and instrumentation connections and terminations.
8. Check electrical equipment prior to installation so that defective equipment is not installed.
9. Provide start-up, follow-up, and training of the Owner's personnel for electrical systems. Make all corrective measures required during start-up. See specific requirements for training and start-up in other specification sections.
10. Provide field services of qualified technicians to supervise and check out the installation of the equipment, to supervise and check out interconnecting wiring, to conduct start-up of operation of the equipment, and to correct any problems, which occur during start-up.

1.04 EQUIPMENT COORDINATION

A. The Contractor is responsible to coordinate the equipment supplied from other manufacturers. This includes but is not limited to:

1. Obtaining specific information on equipment ratings and sizes and verifying the electrical components supplied meet, or match the requirements such as voltage, phase, frequency, starter types, etc.
2. Verifying the equipment supplied will fit within the space allocated.
3. Coordination of equipment and the electrical power and control requirements. Provided in all sections of the specifications and drawings.
4. Providing power and control equipment, wiring, and raceways to meet the requirements of the mechanical equipment supplied.
5. Providing all necessary control wiring and components for any special requirements from an equipment manufacturer.

B. The Contractor shall verify as a minimum:

1. Correct voltage, phase, and frequency.
2. Size and space requirements.

3. Mounting requirements.
4. Correct motor starter type.
5. Proper coordination with the controls and control system Integrator.

C. Any discrepancies between the electrical and other equipment shall be brought to the immediate attention of the Engineer.

D. The Contractor shall take precautions to minimize instrumentation or control interferences that are created by the variable frequency drives (VFD's) or load wiring. The Contractor shall coordinate with the VFD manufacturer to provide necessary separation of conductors or shielding and/or filtering equipment as required by the VFD manufacturer.

1.05 CONSTRUCTION POWER

A. Construction Power:

1. If the existing service is adequate for construction power, then the existing service may be used for construction power and the Owner shall pay all energy costs as billed by the utility on the existing meter.
2. Any new temporary feeders or necessary modifications to the existing electrical system for construction power shall be coordinated and paid for by the Contractor.

1.06 STANDARDS AND CODES

A. Permits, licenses, approvals, and other arrangements for work shall be obtained and paid for by the Contractor and included in the bid price.

B. Electrical work shall be executed in strict accordance with the latest edition of the National Electrical Code and local ordinances and regulations.

C. All electrical equipment, materials, construction methods, tests and definitions shall be in strict conformity with the established standards of the following in their latest adopted revision:

1. Underwriters' Laboratories, Inc. (UL)
2. National Electrical Manufacturers Association (NEMA)
3. Canadian Standards Association (CSA)
4. Electrical Testing Laboratories (ETL)
5. Factory Mutual (FM)
6. All applicable Washington State Codes and local County Codes.

D. All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

E. All materials shall be new, free from defects, of current manufacture, of quality specified or shown. Each type of material shall be of the same manufacturer throughout the work.

1.07 CONTRACT DOCUMENTS

A. The electrical layouts are generally diagrammatic. The location of equipment is approximate unless dimensioned. Exact locations and routing of conduits shall be governed by structural conditions and physical interference's and by locations of electrical terminations on equipment.

1.08 REFERENCE DOCUMENTS

A. The Contractor shall refer to the drawings, project data and shop drawings of other trades for additional details, which affect the proper installation of the work. Diagrams and symbols showing electrical connections are diagrammatic only, and so do not necessarily show the exact physical arrangement of the equipment.

1.09 SITE FAMILIARIZATION

A. Before submitting a bid, the Electrical Contractor shall become familiar with all features of the site, which may affect the execution of the work. The Contractor shall take all field measurements necessary for the work and shall assume full responsibility for their accuracy. The Contractor shall take full responsibility for locating and avoiding all substructures. Any damage to existing equipment shall be repaired or replaced by the Contractor at a cost negotiated with the Owner.

1.10 GROUND SYSTEM

A. Provide grounding and ground system per the NEC.

B. Provide a minimum of two 10 foot x ¾" copper coated steel ground rods or more if required by the drawings. Use welded type connectors for underground connections and bolted type for exposed.

C. Construct metallic raceways to provide a continuous ground path.

D. Connect all electrical equipment enclosures to the ground system.

E. Nonelectrical equipment with metallic enclosures and metallic piping shall be connected to the grounding system as required by NEC.

F. Ground system shall be tested per IEEE standard 81. If greater than 2 ohms then additional ground rods shall be added and paid for as extra work.

G. Bond ground system to metallic piping as required by NEC.

H. Bond ground system to building steel in at least one location and at other locations as shown on the drawings.

1.11 SUBMITTALS

A. Project data shall be submitted in accordance with the general requirements in Division 1.

B. Separate Submittals shall be provided for each spec section. All products for each spec section shall be included in a single PDF document including the cover sheet and index in one single document. Submittals shall be indexed and identified as follows:

1. Email subject line shall be “project name, EI&C submittal submittal #, spec section# - description.”
2. Cover sheet with:
    a. the project name and submittal #.
    b. Contractor's and sub-contractor’s name, phone number, and email address.
    c. index sheet showing each product being submitted.
3. PDF index tabs per the electrical specifications by section and paragraph or equipment name e.g., provide a minimum of one tab section for each piece of equipment in all of the PART 2 PRODUCT Sections 2.01 - 2.
4. Label each equipment submittal sheet with equipment name and number. Indicate location where each item of equipment submitted will be used on the job. Use equipment numbers when available.
5. Identify specific options and cross hatch out any information that is not a part of the specific information for the submitted component.

C. Submittals shall include the manufacturer’s name, address, trade name, catalog model or number, nameplate data, size, layout dimensions, project specification and paragraph reference. Include other information necessary to establish contract compliance of each item proposed to furnish.

D. Long lead items may be submitted separately if pre-approved by the Engineer.

E. Each item shall be clearly marked and provided with adequate sales and technical information to clearly show conformance with all aspects of the specification. Packages not provided as described above or largely incomplete shall be returned to the Contractor, without comment.

F. I&C (Instrument & Control) submittals shall be provided with a Bill of Materials showing quantity, manufacturer's name, catalog number, and supplier name and phone number.

G. Certify on all submittals that the material being proposed conforms to the contract requirements. In the event of any variance, state specifically which portions vary and request a variance in writing.

H. Certify that all furnished equipment is able to be installed in the allocated spaces by stating on each item: “This equipment will be able to be installed in the spaces allocated”.

I. Shop Drawings shall be provided on 11” x 17” sheets maximum size, and shall be scaled using standard engineering or architectural scales. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment.

PART 2 : PRODUCTS

2.01 NAMEPLATES

A. Nameplates shall be provided on all electrical devices, (including but not limited to motor control equipment, disconnect switches and enclosed circuit breakers, transfer switches, control panels and terminal boxes, junction boxes, panels, motors, instruments, solenoids, switches, indicating lights, meters, and all electrical equipment enclosures.)

B. Nameplates shall also be provided on all electrical panel interior equipment, including but not limited to: relays, circuit breakers, power supplies, terminals, contactors, and other devices.)

C. All nameplates shall include the equipment name and number (circuit number and function, if applicable).

D. Nameplates of all powered equipment (including instruments, motors, control panels, HVAC, etc.) and all switches, disconnects, and receptacles shall have included on the nameplate the power source (circuit and panel number, MCP/control panel and circuit #, or MCC and unit number, etc.) that the equipment is fed from.

E. Nameplates on light switches and receptacles shall include the panel and circuit and also include application such as outdoor lights, computer receptacle, etc. if relevant. Nameplates on switches and receptacles can be printed thermal tape.

F. All motors shall have nameplates secured to the terminal box with 1/2” lettering or larger.

G. Nameplates shall be made of 1/16" thick machine engraved laminated phenolic having black letters not less than 3/16" high on white background or as shown on the drawings or other sections of the specifications. Nameplates on the interior of panels and on light switches and receptacles shall be White Polyester with printed thermal transfer lettering and permanent pressure sensitive acrylic; TYTON 822 or equal.

H. All nameplates shall include the equipment name and number (and function, and circuit number if applicable).

I. Provide warning nameplates on all panels and equipment, which contain multiple power sources. Lettering shall be white on red background.

J. Provide information or warning nameplates as required by the NEC or electrical inspector for identification of service disconnects, multiple service disconnects etc.

K. Nameplates shall be secured to equipment with stainless steel screws/fasteners/straps. Epoxy glue may be used where fasteners are not practical if first approved by the Engineer.

2.02 WIRE MARKERS

A. Each power and control conductor shall be identified at each terminal to which it is connected. Conductors size No. 10 AWG or smaller shall have identification sleeves.

B. The letters and numbers that identify each wire shall be machine printed on sleeves with permanent black ink. The figures shall be 1/8 inch high. Sleeves shall be white tubing, sized to fit the conductor insulation. The sleeves shall be shrunk to fit the conductor with hot air after installation.

C. They shall be TMS Thermofit Marker System by Raychem Co., sleeve style wire marking system by W. H. Brady Co., or equal. Adhesive strips are not acceptable. Conductors No. 8 AWG and larger shall use cable markers of the locking tab type. Tabs shall be white plastic with conductor identification number permanently embossed.

2.03 RACEWAY MARKERS

A. Raceway markers shall be nonmetallic with raceway number stamped in 3/16-inch minimum height characters. Tags shall be attached to the raceway with 316 stainless steel wire.

2.04 THERMAL (TEMPERATURE) RATINGS OF EQUIPMENT TERMINATIONS

A. Wiring and circuit breakers on this project are designed for 75°C operation above 30 amperes, 60°C for 30 amperes and below.

B. All products furnished on this project shall have electrical terminations rated for 60°C for ampacities of 30 amperes or less and rated for 75°C for ampacities above 30 amperes.

PART 3 : EXECUTION

3.01 STORAGE AND INSTALLATION ENVIRONMENT

A. All electrical equipment shall be stored in a dry environment free from dust, moisture, sprays or vapors, which may be detrimental to their new condition. After installation of equipment, care shall be taken to protect all equipment from all dust, moisture, paint and other spray, harmful vapors, etc. until final acceptance and certificates of occupancy have been obtained.

B. Equipment shall not be installed in indoor areas until the area is covered, dry and finished to the point that other work will not create dust, vapors, or moisture. Equipment with integral heaters and fans shall not be installed until power is available at the location and the heater and fan shall be energized within 6 hours of the equipment being installed.

3.02 SITE INSPECTIONS

A. Prior to final acceptance the Engineer will perform one or more site observation trips to develop a “punch list” of items deemed incomplete.

B. Each punch list item shall be completed by the Contractor and checked off the list. When all the items on the list are completed or commented on, the list shall be signed by the Contractor and returned to the Engineer for verification.

3.03 FINAL ACCEPTANCE

A. When all work is complete, the Contractor shall call the Engineer for the final acceptance testing inspections. The Electrical Contractor and System Integrator shall be present while these inspections are taking place and shall be available for opening cabinets and operating and adjusting the system as is necessary for the Engineer to verify all equipment is installed and operates to the requirements of the contract documents.

B. The contractor shall anticipate a minimum of 8 hours for each site to complete the final acceptance testing.

C. Prior to the Contractor calling for this observation, the Contractor shall have completed all items of work, including wire markers, nameplates, final tests and final test reports. All equipment shall be checked for proper operation and all signals verified for correct calibration and wiring.

D. Final acceptance will not be given until:

1. All work is complete
2. All “site inspection” punch-lists are checked off and returned to the Engineer
3. All test reports are received
4. All O&M manuals are received
5. All spare parts are received
6. All instrument test forms are received
7. All project record drawings are received.

3.04 PROJECT RECORD DRAWINGS

A. A set of drawings shall be maintained at the job site (by the Electrical Contractor) showing any deviations in the electrical systems from the original design. These drawings shall conform to the requirements for Project Record Drawings in Division 1.

3.05 CLEANUP

A. The premises must be kept free of accumulated materials, rubbish and debris at all times. Surplus material, tools and equipment must not be stored at the job site. At the completion of the job, all equipment and fixtures shall be left clean and in proper condition for their intended use.

B. All motor control equipment and control panels shall be cleaned inside and out at the completion of the project.

3.06 TESTS

A. Testing for installed feeder cables and motors is required as specified in other Sections. Test reports shall be submitted to the Engineer prior to final acceptance. All tests shall be performed in accordance with the applicable sections of NETA.

B. Where specified in the individual product specification section, factory tests shall be performed at the place of fabrication and performed on completion of manufacture or assembly. The costs of factory tests shall be included in the contract price.

3.07 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall prepare and assemble detailed operation and maintenance and repair manuals as described in Division 1.

3.08 TRAINING

A. Training shall be provided per the specific requirements in other Sections of these specifications. In addition to training required in other Sections of the specifications, the Contractor shall conduct specifically organized training sessions in the overall operation and maintenance of the electrical system for personnel employed by the Owner. The training sessions shall be conducted to educate and train the personnel in operations and maintenance of all components of the electrical system outside the training requirements in the other Sections. Training shall include, but not be limited to, the following:

1. Preventative maintenance procedures
2. Trouble-shooting
3. Calibration
4. Testing
5. Replacement of components
6. Equipment operation

END OF SECTION 26 00 00

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SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 : GENERAL

1.01 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 26 05 23 - Control-Voltage Electrical Power Cables for control systems communications cables and Classes 1, 2 and 3 control cables.

1.02 DEFINITIONS

A. VFC: Variable frequency controller.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 : PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Basis-Of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. Alpha Wire.
2. Belden Inc.
3. Encore Wire Corporation.
4. General Cable Technologies Corporation.
5. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2, Type THHN-2-THWN-2, and Type XHHW-2.

2.02 CONNECTORS AND SPLICES

A. Basis-Of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. AFC Cable Systems, Inc.
2. Gardner Bender.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. Ilsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical Markets Division.
9. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 : EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.

B. Feeders Concealed in Concrete, Below Slabs-On-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

C. Exposed Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Concrete, Below Slabs-On-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 - Raceways and Boxes for Electrical Systems prior to pulling conductors and cables.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

B. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 00 00 - General Electrical.

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.06 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 26 05 19

SECTION 26 05 23
CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 : GENERAL

1.01 SUMMARY

A. Section includes:

1. Multimode optical-fiber cabling. 50/125-micrometer.
2. UTP cabling.
3. Low-voltage control cabling.
4. Control-circuit conductors.
5. Identification products.

1.02 DEFINITIONS

A. EMI: Electromagnetic interference.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

B. Field quality-control reports.

PART 2 : PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.02 PERFORMANCE REQUIREMENTS

A. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.03 OPTICAL FIBER CABLE

A. Description: Multimode, **50/125**-micrometer, 12-fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA/EIA-492AAAA-B for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
   a. General Purpose, Nonconductive: Type OFN or OFNG.
5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

B. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.04 OPTICAL-FIBER CABLE HARDWARE

A. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

B. Patch Cords: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.

C. Cable Connecting Hardware:

1. Comply with Optical-Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA-568-C.3.
2. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss of not more than 0.75 dB.
3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.05 UTP CABLE

A. Description: 100-ohm, four-pair UTP.

1. Comply with ICEA S-90-661 for mechanical properties of Category 6 cables.
2. Comply with TIA-568-C.1 for performance specifications.
3. Comply with TIA-568-C.2, Category 6.

4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with NEMA WC 66, UL 444 and NFPA 70 for the following types:

   a. Communications, General Purpose: Type CM, Type CMG, Type CMP, or Type CMR in listed communications raceways.

2.06 UTP CABLE HARDWARE

A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

2.07 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.

2.08 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.

B. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44.

2.09 SOURCE QUALITY CONTROL

A. Factory test UTP cables according to TIA-568-C.2.

B. Factory test optical-fiber cables according to TIA-568-C.3.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 : EXECUTION

3.01 EXAMINATION

A. Test cables on receipt at Project site.

1. Test optical-fiber cable to determine the continuity of the strand end to end. Use optical-fiber flashlight.
2. Test optical-fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

3.02 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 26 05 33 - Raceways and Boxes for Electrical Systems for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.

1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
2. Outlet boxes for optical-fiber cables shall be no smaller than 4 inches (102 mm) square by -1/8 inches (53 mm) deep with extension ring sized to bring edge of ring to within 1/8 inch (3.1 mm) of the finished wall surface.
3. Flexible metal conduit shall not be used.

B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.

C. Install manufactured conduit sweeps and long-radius elbows if possible.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1 and NFPA 70.

B. General Requirements for Cabling:

1. Comply with TIA-568-C Series of standards.
2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems."
3. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced.
5. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Install lacing bars and distribution spools.

7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Do not use heat lamps for heating.
9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Monitor cable pull tensions.
10. Support: Do not allow cables to lay on removable ceiling tiles.
11. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.

C. UTP Cable Installation:

1. Comply with TIA-568-C.2.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 26 05 33.

E. Optical-Fiber Cable Installation:

1. Comply with TIA-568-C.3.
2. Terminate cable on connecting hardware that is rack or cabinet mounted.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches (305 mm).
3. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches (1200 mm).

3.04 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.05 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 14 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.06 GROUNDING

A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

3.07 IDENTIFICATION

A. Comply with requirements for identification specified in Section 26 00 00 - General Electrical.

B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

3.08 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Visually inspect UTP and optical-fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross-connection.
    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical-Fiber Cable Tests:

   a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.0. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

   b. Link End-to-End Attenuation Tests:

      1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.

      2) Attenuation test results for links shall be less than 2.0 dB.

B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 05 23

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SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 : GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Section 26 05 48.16 - Seismic Controls for Electrical Systems for products and installation requirements necessary for compliance with seismic criteria.

1.02 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.03 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.06 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

PART 2 : PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Atkore International.
    g. Wesanco, Inc.
2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1) Hilti, Inc.
        2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.

2) Empire Tool and Manufacturing Co., Inc.

3) Hilti, Inc.

4) ITW Ramset/Red Head; Illinois Tool Works, Inc.

5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.

7. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 : EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least **25** percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
7. To Light Steel: Sheet metal screws.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 - Cast-in-Place Concrete.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

A. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 26 05 29

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SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 : GENERAL

1.01 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.02 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. LFMC: Liquidtight flexible metal conduit.

C. RNC: Rigid nonmetallic conduit.

1.03 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.

C. Source quality-control test reports.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 : PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. EMT: ANSI C80.3.

C. LFMC: Flexible steel conduit with PVC jacket.

D. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

E. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

B. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

2.03 METAL WIREWAYS

A. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 12, unless otherwise indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Hinged type.

D. Finish: Manufacturer's standard enamel finish.

E. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

F. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.04 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

PART 3 : EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed: Rigid steel conduit.
2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.02 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

1. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.

2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

J. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.

2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.

4. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.04 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 05 48.16
SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 : GENERAL

1.01 SUMMARY

A. Section includes:

1. Restraint channel bracings.
2. Restraint cables.
3. Seismic-restraint accessories.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

B. Related Requirements:

1. Section 26 05 29 - Hangers and Supports for Electrical Systems for commonly used electrical supports and installation requirements.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic forces required to select seismic restraints and for designing vibration isolation bases.
    a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Seismic-Restraint Details:

   a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

1.03 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

D. Comply with NFPA 70.

PART 2 : PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: **B**.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: I.
   a. Component Importance Factor: 1.5.
   b. Component Response Modification Factor: 1.5.
   c. Component Amplification Factor: 1.0.

3. Design Spectral Response Acceleration at Short Periods (0.2 Second).
4. Design Spectral Response Acceleration at 1.0-Second Period.

2.02 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a Division of Cooper Industries.
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Unistrut; Atkore International.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.03 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:

1. Cooper B-Line, Inc.; a Division of Cooper Industries.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. TOLCO; a brand of NIBCO INC.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies For wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.04 MECHANICAL ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a Division of Cooper Industries.
2. Hilti, Inc.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.05 ADHESIVE ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hilti, Inc.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.

B. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 : EXECUTION

3.01 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 03 30 00 - Cast-in-Place Concrete.

B. Equipment and Hanger Restraints:

1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-In Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.05 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 26 05 48.16

SECTION 26 12 10
DRY TYPE TRANSFORMERS

PART 1 : GENERAL

1.01 SUMMARY

A. Provide dry type, step-down transformers for supplying building power requirements from the 480-volt primary system.

1.02 MATERIALS

A. All materials shall be new, free from defects, of current manufacture, of quality specified or shown. Each type of material shall be of the same manufacture throughout the work.

1.03 REFERENCES

A. All materials and equipment specified herein shall be within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

B. All materials and equipment specified herein shall conform with all applicable National Electrical Manufacturers Association (NEMA), American National Standards Institute (ANSI) and Institute of Electrical and Electronics Engineers (IEEE) standards.

C. All materials and equipment specified herein, and their installation methods shall conform to the latest published version of the National Electric Code (NEC).

1.04 EQUIPMENT SIZE

A. Electrical equipment shall fit in the space provided on the plan drawings or as specified. Equipment heights shall not exceed those shown or specified. Larger equipment shall not be considered acceptable. Equipment that is larger than specified shall not be considered equivalent.

1.05 SUBMITTALS

A. In accordance with the submittal requirements in Section 26 00 00 - General Electrical, provide the following submittal information:

1. Catalog data showing material information and conformance with specifications.
2. Manufacturer name and address.

PART 2 : PRODUCTS

2.01 TYPE

A. Dry type transformers shall be constructed of heavy gauge sheet steel. Coil and terminal chamber shall be constructed with guarded opening for ventilation and convection cooling.

2.02 WINDINGS

A. General Purpose Transformers:

1. Separate primary and secondary windings shall have Class H insulation and shall be rated for continuous operation at rated kVA with temperature rise of not over 150 degrees C above a 40 degree C ambient, with a maximum hot spot temperature of 220 degrees C. Windings, core and coil assembly shall be treated and built to resist the effects of dirt and moisture.

2.03 PRIMARY TAPS

A. General Purpose Transformers:

1. Unless otherwise noted or shown, transformers shall be provided with a minimum of four full capacity taps, minimum of two 2-1/2 percent above and two 2-1/2 percent below normal (rated) primary voltage.

2.04 CAPACITY

A. Transformers furnished shall have a continuous rating of not less than the size noted on the drawings.

2.05 CONNECTIONS

A. Provisions for external connections shall be made by means of a terminal board employing lugs compatible for the external conductors to be installed.

2.06 GROUNDING

A. The core of the transformer shall be grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE ANSI standards.

2.07 NOISE LEVEL

A. Acoustical Society of America (ASA) rated quiet type.

2.08 EQUIPMENT

A. Acceptable manufacturers for dry type transformers shall be General Electric, Westinghouse, Square D, Heavy Duty and approved equals.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Transformers shall include internal "rubber-in-shear" isolation mounts selected per manufacturer's recommendations or shall be installed with "KORFUND" or equal external vibration isolators.

3.02 IDENTIFICATION

A. The transformer shall be identified with phenolic nameplates. Nameplates shall be white background with ¼ inch black letters, secured in place with screws.

B. The nameplate shall state the following: Transformer identification tag, voltage rating and phase, primary circuit breaker location/circuit number.

END OF SECTION 26 12 10

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SECTION 26 24 16
PANELBOARDS

PART 1 : GENERAL

1.01 SUMMARY

A. Section includes:

1. Lighting and appliance branch-circuit panelboards.

1.02 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. SPD: Surge Protective Device.

1.03 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.05 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

B. Panelboard Schedules: Provide schedules showing layouts and sizes of all branch circuit breakers. At project completion, provide updated panelboard schedules with as-built conditions for installation in panels.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 91 12 - Operation and Maintenance Data, include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or a Nationally Recognized Testing Laboratory (NRTL).

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    a. Ambient Temperature: Not exceeding 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.11 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 : PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.

B. Enclosures: Surface-mounted cabinets.

1. Rated for environmental conditions at installed location.
    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions.

3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

4. Finishes:

   a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

   b. Back Boxes: Same finish as panels and trim.

5. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.

2. Main and Neutral Lugs: Mechanical type.

3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event. "

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.03 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.04 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    f. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.

2.05 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 : EXECUTION

3.01 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 72" above finished floor unless otherwise indicated.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices not already factory installed.

E. Install filler plates in unused spaces.

F. Comply with NECA 1.

3.03 IDENTIFICATION

A. Create a directory to indicate installed circuit loads; incorporate any field changes. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

B. Panelboard Nameplates: Label each panelboard with a phenolic nameplate.

3.04 FIELD QUALITY CONTROL

A. Perform Tests and Inspections:

1. Inspect components, assemblies, and equipment installations, including connections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

3.05 ADJUSTING

A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.

END OF SECTION 26 24 16

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SECTION 26 27 26
WIRING DEVICES

PART 1 : GENERAL

1.01 SUMMARY

A. Section includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Snap switches.

1.02 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 : PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).

4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.03 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; 5351 (single), CR5362 (duplex).
   b. Hubbell; HBL5351 (single), HBL5352 (duplex).
   c. Leviton; 5891 (single), 5352 (duplex).
   d. Pass & Seymour; 5361 (single), 5362 (duplex).
2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.

2.04 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; VGF20.
   b. Hubbell; GFR5352L.

c. Pass & Seymour; 2095.

d. Leviton; 7590.

2.05 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Single Pole:

1) Cooper; AH1221.

2) Hubbell; HBL1221.

3) Leviton; 1221-2.

4) Pass & Seymour; CSB20AC1.

b. Two Pole:

1) Cooper; AH1222.

2) Hubbell; HBL1222.

3) Leviton; 1222-2.

4) Pass & Seymour; CSB20AC2.

c. Three Way:

1) Cooper; AH1223.

2) Hubbell; HBL1223.

3) Leviton; 1223-2.

4) Pass & Seymour; CSB20AC3.

d. Four Way:

1) Cooper; AH1224.

2) Hubbell; HBL1224.

3) Leviton; 1224-2.

4) Pass & Seymour; CSB20AC4.

2.06 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.

2.07 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: Ivory unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination With Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.02 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.03 IDENTIFICATION

A. Comply with Section 26 00 00 - General Electrical.

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.04 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 27 26

SECTION 26 29 13.13
ACROSS-THE-LINE MOTOR CONTROLLERS

PART 1 : GENERAL

1.01 SUMMARY

A. This Section specifies the requirements for magnetic motor starters.

1. Full voltage, non-reversing combination magnetic motor starters.

1.02 REFERENCES

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
2. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
3. NEMA AB 1 - Molded Case Circuit Breakers.
4. NEMA KS 1 - Enclosed Switches.
5. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.03 SUBMITTALS

A. Product Data:

1. Submit manufacturer’s product data.
2. Provide submittal information under for these products under this Section.

B. Record Documents:

1. Submit dimensioned Drawings showing size, circuit breaker, fusible switch and combination starter arrangement and equipment ratings including, but not limited to, voltage, bus ampacity, integrated short circuit ampere rating.
2. Provide data on relays, pilot devices, switching and overcurrent protection.
3. Indicate enclosure NEMA rating and material.

C. Operation and Maintenance Data:

1. Provide operating and maintenance manuals.

PART 2 : PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state, and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide enclosure for each motor controller.

C. All equipment provided under this Section must be from the same manufacturer. Basis of Design manufacturer:

1. Schneider Electric (Square D).
2. Or approved equal.

2.02 MOTOR STARTERS

A. Each motor shall be provided with proper starting equipment.

1. Starting equipment, unless specified or scheduled to the contrary, shall be provided by the trade furnishing the motor.
2. All motor starting equipment provided by any one trade shall be of the same manufacturer unless such starting equipment is an integral part of the equipment on which the motor is mounted.
3. Furnish all motor starters required.

B. Magnetic Motor Starter:

1. Type: Provide magnetic, full-voltage, non-reversing motor starters unless otherwise indicated.
2. Overload Relays: Provide solid-state motor control overload relays.
3. Contactor:
    a. Size contactors according to NEMA standards or as shown; however, minimum shall be size 1.
    b. Provide main pole in each phase leg, the number and type of auxiliary contacts to perform the required functions, and two (2) spare auxiliary contacts, one (1) normally open and one (1) normally closed.
    c. Use double break contacts of silver-cadmium oxide or similar material to minimize sticking or welding.
    d. Provide contactor coils suitable for continuous operation at 120 volts, 60 hertz or 24 volts, direct current as indicated on the plans.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with the manufacturer's published recommendations.

C. Anchor assembly to housekeeping pad.

D. Select overload heaters for motor in accordance with manufacturer's recommendations for the voltage and full load amperes listed on the nameplate data of each motor actually installed.

E. Adjust operating mechanisms for free mechanical movement.

F. Touch-up scratched or marred surfaces to match original finish.

G. Identify starters as to equipment served with engraved laminated phenolic nameplates. Refer to Section 26 00 00 - General Electrical for nameplate information.

3.02 TESTING

A. Subsequent to wire and cable connections, energize motor controllers and demonstrate functioning in accordance with manufacturer's requirements.

END OF SECTION 26 29 13.13

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SECTION 26 29 23.10
VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 : GENERAL

1.01 SUMMARY

A. Section includes, preassembled, combination Variable Frequency Drive/Variable Frequency Motor Controllers (VFD) rated 600 V and less, for speed control of multistage centrifugal air scour blower motors.

B. Section includes line filters preassembled into the drive enclosures.

C. Section includes thermostatically-controlled enclosure heaters. Drive enclosures will be installed in an unheated building.

D. Section includes integration with blower safety devices, including bearing RTDs, motor winding thermostats, and vibration sensors.

1.02 DEFINITIONS

A. VFD: Variable-frequency motor controller, variable-frequency drive.

1.03 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFD indicated.

1. Include dimensions and finishes for VFDs.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each VFD indicated:

1. Include mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.04 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each VFD from manufacturer.

B. Source quality-control reports.

C. Field quality-control reports.

D. Sample Warranty: For special warranty.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFDs to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and motor-circuit protector trip settings.

b. Manufacturer's written instructions for setting field-adjustable overload relays.

c. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.

d. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

1.06 DELIVERY, STORAGE, AND HANDLING

A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFDs, including clearances between VFDs, and adjacent surfaces and other items.

1.07 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace VFDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 : PRODUCTS

2.01 MANUFACTURER

A. Provide Yaskawa GA800 Configured drive package, no substitutions.

2.02 SYSTEM DESCRIPTION

A. General Requirements for VFDs:

1. VFDs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Comply with NEMA ICS 7, NEMA ICS 61800-2.

B. Application: Variable torque.

C. VFD Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested, and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors, as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

D. Design and Rating: Match load type; and type of connection used between motor and load such as direct or through a power-transmission connection.

E. Input Rating: Three phase, 480VAC, 60 Hz.

F. Output Rating: Three phase, 480V; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

G. Enclosure: NEMA 12, factory-assembled with through door handle for disconnecting power.

H. Enclosure heater: Provide a thermostatically-controlled enclosure heater to maintain enclosure above the dew point. Power for the enclosure heater shall be derived from a control power transformer.

I. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFD input voltage rating.
2. Input Frequency Tolerance: Plus or minus 3 percent of VFD frequency rating.
3. Minimum Efficiency: 97 percent at 60 Hz, full load.
4. Minimum Short-Circuit Current (Withstand) Rating: 10 kA.
5. Ambient Temperature Rating: Not less than 32 deg F (0 deg C) and not exceeding 104 deg F (40 deg C).
6. Humidity Rating: Less than 95 percent (noncondensing).
7. Altitude Rating: Not exceeding 3300 feet (1000 m).
8. Vibration Withstand: Comply with NEMA ICS 61800-2.
9. Overload Capability: 1.1 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.

10. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
11. Speed Regulation: Plus or minus 5 percent.
12. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
13. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

J. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.

K. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 0.1 to 999.9 seconds.
4. Deceleration: 0.1 to 999.9 seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

L. Self-Protection and Reliability Features:

1. Surge Suppression: Surge suppressors complying with UL 1449 SPD, Type 2.
2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
3. Under- and Overvoltage Trips. Drive shall be capable of automatically resetting after power disturbance, independent of other fault conditions.
4. Inverter overcurrent trips.
5. VFD and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFDs and motor thermal characteristics, and for providing VFD overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
6. Critical frequency rejection, with three selectable, adjustable deadbands.
7. Instantaneous line-to-line and line-to-ground overcurrent trips.
8. Loss-of-phase protection.
9. Reverse-phase protection.
10. Short-circuit protection.
11. Motor-overtemperature fault.

M. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

N. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.

O. Bidirectional Autospeed Search: Capable of starting VFD into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

P. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

2.03 PERFORMANCE REQUIREMENTS

A. Seismic Performance: VFDs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The designated VFDs shall be tested and certified by an NRTL as meeting the ICC-ES AC 156 test procedure requirements.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.04 CONTROLS AND INDICATION

A. Door-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability. Mount in interior PCP door.

1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.
    a. Control Authority: Supports at least four conditions: Off, local manual control at VFD, local automatic control at VFD, and automatic control through a remote source.
3. Status indicators displaying the following conditions:
    a. Power on.
    b. Run.
    c. Overvoltage.
    d. Line fault.
    e. Overcurrent.
    f. External fault.

B. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.

4. Fault log, maintaining last four faults with time and date stamp for each.

C. Indicating Devices: Digital display and additional readout devices as required, connected to display VFD parameters including, but not limited to:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

D. Control Signal Interfaces:

1. Electric Input Signal Interface:
   a. A minimum of two programmable analog inputs: 4- to 20-mA dc.
   b. A minimum of six multifunction programmable digital inputs.
2. Output Signal Interface: A minimum of one programmable analog output signal(s) 4- to 20-mA dc, which can be configured for any of the following:
   a. Output frequency (Hz).
   b. Output current (load).
   c. DC-link voltage (V dc).
   d. Motor torque (percent).
   e. Motor speed (rpm).
   f. Set point frequency (Hz).
3. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:
   a. Motor running.
   b. Set point speed reached.
   c. Fault and warning indication (overtemperature or overcurrent).
   d. PID high- or low-speed limits reached.

E. Blower Protective Devices:

1. Vibration Sensors: Vibration sensors shall be powered from the drive enclosure. Drives shall be wired and configured to shut down and alarm on high vibration.

2. Bearing RTDs: The drives shall be provided with RTD controllers with temperature displays. Bearing RTDs shall be wired and configured to shut down and alarm on high bearing temperature.
3. Motor Winding Thermostats: The drives shall be wired and configured to shut down and alarm on high motor winding temperature

2.05 LINE REACTORS

A. General Requirements for Line Reactors:

1. The reactor shall be three-phase, 600 V class, consisting of an inductance value of nominally 3% the rating of the drive.

B. Performance:

1. The reactor shall be rated for nominal system voltage (690 V max), fundamental system frequency (50 Hz or 60 Hz) and current.
2. The reactor impedance shall be 3 percent at full rated system current and at the fundamental system frequency.
3. The reactor shall be rated to operate in ambient temperatures from -40°C to 45°C under enclosed conditions.
4. The reactor shall operate at rated current with a maximum average winding temperature rise of 135°C.
5. Reactors rated less than 750 A shall be capable of continuously operating at 150 percent of rated current.
6. The reactor shall be capable of 30 minutes of operation at 200 percent of rated current, and 1 minute of operation at 300 percent of rated current.
7. The reactor shall function properly for switching frequencies up to 20 kHz.
8. The reactor shall function as rated at altitudes up to 3,000 feet.
9. The reactor shall have an insulation system to provide 3,000 V RMS of dielectric strength coil-to-coil and coil-to-core.

C. Construction:

1. The reactor construction shall utilize copper wire or copper foil for the windings.
2. The reactor shall utilize a class N insulation system, maximum temperature 200°C.
3. The reactor shall have a core to carry the magnetic flux comprised of laminations of electrical grade silicon steel.
4. The core of the reactor shall be locked in place using steel banding.
5. All terminations shall be copper alloy taps or UL-recognized terminal blocks.
6. The reactor shall be vacuum-dipped and baked with epoxy resin.
7. The reactor shall be suitable for mounting within a low-voltage variable frequency drive enclosure.

2.06 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFD enclosure cover unless otherwise indicated.

1. Controller console.
2. RTD monitor.

B. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

2.07 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFDs according to requirements in NEMA ICS 61800-2.

1. Test each VFD while connected to a motor that is comparable to that for which the VFD is rated.
2. Verification of Performance: Rate VFDs according to operation of functions and features specified.

B. VFDs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 : EXECUTION

3.01 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFDs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

B. Examine VFD before installation. Reject VFDs that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFD installation.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

F. Install fuses in each fusible-switch VFD.

G. Install fuses in control circuits if not factory installed.

H. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

I. Comply with NECA 1.

3.02 CONTROL WIRING INSTALLATION

A. Install wiring between VFDs and remote devices.

B. Bundle, train, and support wiring in PCP enclosures.

C. Connect selector switches and other automatic-control devices where applicable.

3.03 IDENTIFICATION

A. Identify VFDs, components, and control wiring.

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFD with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

B. Operating Instructions: Frame printed operating instructions for VFDs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFD units.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a factory-authorized service representative.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each VFD element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Inspect VFD, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each VFD element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFD locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Owner before starting the motor(s).
5. Test each motor for proper phase rotation.

6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in National Electrical Testing Association (NETA) Acceptance Testing Specification. Certify compliance with test parameters.

7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. VFDs will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies the VFD and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.05 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.06 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

3.07 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

B. Replace VFDs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.08 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFDs.

END OF SECTION 26 29 23.10

SECTION 26 43 10
SURGE PROTECTIVE DEVICE

PART 1 : GENERAL

1.01 SUMMARY

A. Provide Surge Protective Devices (SPD) for service entrance and distribution equipment protection as shown on the drawings.

1.02 DEFINITIONS

A. LED: Light Emitting Diode.

B. SCR: Silicon Controlled Rectifier.

C. SPD: Surge Protective Device.

1.03 SUBMITTALS

A. Provide submittals for all required testing and pertinent manufacturer information described herein. Surge suppression submittals shall include, but shall not be limited to the following items:

1. Dimensioned drawing of each SPD type indicating mounting arrangement.
2. Manufacturer shall include its UL 1449 Second Edition file number(s).
3. Manufacturer shall include its UL 1283 file number(s).
4. Letter from manufacturer verifying SPD incorporates “directly-connected-protection -elements” between all possible modes in every given service rating (i.e., line-to-neutral, line-to-line, line-to-ground, neutral-to-ground).
5. Certified test data documenting IEEE C62.41.2 performance (as defined herein), and the ability of the device to meet or exceed all requirements of this specification.
6. Warranties: As specified in this Section.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least ten (10) years of engineering experience in the design and manufacture of permanently connected SPD.

B. Operates a Quality System Certified manufacturing facility as ISO 9001:2000 Compliant.

1.05 REFERENCES

A. UL 1449 2nd Edition listed, UL 1283 listed, CUL, ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002, NEMA LS-1, 1992 2.2.7, IEEE Std. 1100-1999 Section 8.6.1.

B. ANSI C84.1, American National Standard for Electric Power Systems and Equipment – Voltage Ratings.

C. National Electrical Code (NEC) Article 285.

1.06 SURGE PROTECTIVE DEVICE LOCATIONS

A. Provide surge suppressor at each building disconnect or main circuit breaker and at other panelboard locations as indicated on the Contract Drawings.

PART 2 : PRODUCTS

2.01 GENERAL REQUIREMENTS

A. SPD devices shall be rated for the class of service necessary for the application.

B. SPD devices shall be designed for AC power systems with a minimum of AC follow current after operation.

C. The SPD shall have sine-wave tracking capability.

D. Manufacturer shall provide permanently-connected devices mounted parallel to the service, distribution and sub panels and series connected devices as required for individual equipment protection as indicated on Contract Drawings. SPD device drawings shall be made available upon request.

E. SPD circuitry shall include only solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that “crowbar” (e.g., spark gaps, gas tubes, SCRs, etc.) shall not be accepted. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound and be of a parallel design.

F. Electrical Performance Characteristics:

1. Service ratings:

a. 480Y/277V Three-phase 4-wire + Gnd

G. SPD Ratings: SPD devices supplied shall provide four mode protection, 100 kA surge current rated (per phase).

H. Fusing:

1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. Surge protective devices shall contain short circuit current safety fusing within each device where no circuit breaker is specified, for over-current requirements of the NEC.

2. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under UL 1449 2nd Edition.

3. The SPD shall be of a parallel design using fast-acting transient energy protection that will divert and dissipate the surge energy.

4. The SPD shall be self-restoring and fully automatic with a total response time approximately one (1) nanosecond.

5. The maximum continuous operating voltage shall be capable of sustaining 115% of nominal RMS voltage continuously without degrading.

6. The SPD shall be UL listed at or above the available fault current level at the point of TVSS application, per UL 1449 3rd Edition, as amended. The SPD shall be marked with the short circuit current rating. The SPD short circuit rating shall be, as a minimum, the same rating as the power distribution equipment to which it is connected.

7. Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, totally encapsulated, custom parallel and solid state.

I. Features:

1. Surge protective devices shall provide on-board visual status of their operational readiness by LED indicator lights. Contacts shall be provided for wiring remote indication.

J. Maintenance Restrictions:

1. No suppression unit shall be supplied which requires scheduled preventive- maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor SPD status are not acceptable. SPD devices shall require no routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon expiration.

K. Warranty:

1. The manufacturer shall provide unlimited free replacement of the entire SPD (not just modules, components, or sub-assemblies) for all inoperable TVSS during the warranty period. Minimum warranty period shall be 25 (Twenty-Five) years.

L. Enclosures:

1. Unless otherwise noted, NEMA 4 (or better) enclosures for indoor installations.

PART 3 : EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Provide surge suppressor to be installed at each building service entrance gear, transfer switch, or other location (service entrance), that the service encounters as it enters the facility and/or as indicated on Contract Drawings. Also, provide SPD devices at all distribution and panel-board locations as indicated on Contract Drawings. The TSPD shall be located within or immediately adjacent to the switchboard or panelboard being protected (close-nipple). The SPDs shall be connected on the load side of the over-current protective device to which it is

connected as per UL 1449 and NEC Art. 285, of the electrical service it is protecting. Unless otherwise specified, provide a 30A breaker for each TVSS device.

NOTE TVSS marked L1, L2, L3, N, and GND (as applicable) must be connected, respectively, to phase(s), neutral, and ground.

B. The location of the SPD shall be chosen to minimize the lead lengths between the SPD and the circuit breaker to which it is connected. SPD device leads which are mounted external to the panel, must be routed within a metal conduit, when necessary (rigid nipple if possible), and kept as short and straight as possible. Wire size for leads shall be as specified by manufacturer, minimum size 6mm^2 (#10 AWG), maximum size 25mm^2 (#4 AWG).

C. Surge protective devices shall be installed neatly. Bind the phase, neutral, and ground conductors tightly, over the entire run, from the suppressor to the service panel, and always use the shortest length of connecting cable possible.

D. Connect surge protector to the grounding system.

E. The electrical contractor (installer) shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall assure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor shall further ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.

F. All labor, materials, equipment, and services necessary for, and incidental to, the installation of the SPD system components as specified herein shall be provided by the electrical contractor (installer).

END OF SECTION 26 43 10

SECTION 26 50 00
LIGHTING

PART 1 : GENERAL

1.01 SUMMARY

A. This Section covers furnishing and installation of all light fixtures indicated on the drawings or specified herein.

1.02 REFERENCES

A. All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

B. All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.

C. All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, NEC.

1.03 SUBMITTALS

A. Submit catalog data showing material information and conformance with Division 1 and Section 26 00 00 - General Electrical. The intended use of each item shall be indicated.

PART 2 : PRODUCTS

2.01 LIGHT FIXTURES

A. The fixture catalog numbers listed in the fixture schedule indicate manufacturer, fixture design, quality of design and manufacture, appearance, features, and options required. Lighting fixtures specified will be the basis for comparison in the consideration of fixtures of other manufacturers. Fixtures of lesser quality shall not be considered equivalent.

B. Contractor shall investigate ceiling construction and supply fixtures designed for the application.

C. Contractor shall investigate possible interferences of equipment, hatches, structural elements, etc. and supply fixtures (size and profile) that will not interfere.

D. All fixture component parts shall be manufactured and/or assembled at the manufacturing plant for shipment. The shipment from the fixture manufacturer shall include integrally mounted and/or remote mounted ballasts where ballasts are required for the proper operation of the fixture lamps.

2.02 HARDWARE

A. The Contractor shall provide any necessary hardware for mounting fixtures. The mounting hardware shall be made of materials suitable for the environment installed. Provide materials made from aluminum, non-metallic, or stainless steel in outdoor, damp, or corrosive areas.

2.03 LAMPS

A. Provide LED fixtures only.

2.04 SPECIAL ACCESSORIES

A. Provide accessories such as junction boxes, plastic frames, stems, hangers, canopies, couplings, cords, toggle bolts, etc., necessary to mount fixture in a proper and approved method.

2.05 CONTROLS

A. Photoelectric Relay:

1. Exterior fixtures shall have photoelectric relays factory installed to turn off lights during daylight.

PART 3 : EXECUTION

3.01 RACEWAY & WIRE

A. For all lights, switches, and other related devices of the lighting system, provide all necessary raceway and wire for a complete installation.

3.02 FIXTURE MOUNTING

A. The fixture supplier shall provide all necessary hanging or mounting devices for all fixtures and shall be responsible for checking the type needed for various ceiling conditions.

B. The Contractor shall see that all lighting fixtures designed to be installed throughout the project shall be of the correct size and design to properly suit the requirements of each area prior to ordering fixtures.

C. Contractor shall install fixtures to avoid access hatches, sky lights, rails, mechanical equipment, etc.

D. Any additional hardware needed for installation of fixtures shall be provided by the Contractor; including poles, clamps, brackets, screws, bolts, etc.

E. Properly support and align fixtures and provide all necessary steel shapes for support of the fixtures. Coordinate complete fixture installation with the facility construction. Clean immediately prior to final inspection.

F. Square and rectangular fixtures shall be mounted with sides parallel to building lines and parallel with ceiling lines.

END OF SECTION 26 50 00

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SECTION 28 13 00
ACCESS CONTROL

PART 1 : GENERAL

1.01 SUMMARY

A. Provide access control devices as shown on the Drawings. Design and provide all cabling as required to connect all new devices to the Owner's existing access management software (Honeywell ProWatch).

B. The Owner will add the new building door to employee's access badges.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Diagrams for cable management system.
2. System labeling schedules.
3. Wiring Diagrams. For power, signal, and control wiring.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain controllers, identifier readers, and other components through one source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70, "National Electrical Code."

PART 2 : PRODUCTS

2.01 CARD READERS

A. Card-Reader Power: Powered from its associated controller, including its standby power source, and shall not dissipate more than 5 W.

B. Card reader shall be 5-12VDC, up to 4-1/4" range, with Wiegand output access controls.

C. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the controller. Response time shall be 800 millisecond (ms) or less, from the time the card reader finishes reading the credential card until a response signal is generated.

D. Enclosure: Suitable for surface, semi-flush, pedestal, or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:

1. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.

E. Card readers shall be HID RP40, multiclass, SE E, LF STD, HF STD/SIO/SEOS, WEIG, PIG, BLK, STD-1, LED RED, FLSH GRN, BZR ON, CSN 34-BIT MSB, IPM OFF.

2.02 PROCESSING PANEL

A. Provide a smart terminal four-reader processing panel for the new building. Processing panel shall be Continental Instrument CICP1400, or equal.

2.03 DOOR HARDWARE INTERFACE

A. Exit Device: Provide request to exit motion detector over each door. Motion detector shall be Bosch Security Systems DS160, or equal. Provide trim plates.

B. Electric Door Strikes: Use end-of-line resistors to provide power-line supervision. Signal switches shall transmit data to controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and they shall report a forced entry. Power and signal shall be from the controller.

C. Door Monitoring Limit Switches: Provide magnetic door monitoring switches for each personnel and roll-up door.

2.04 CABLES

A. Provide industrial armored cables for surface mounting in new building.

B. TIA 232-F Cables:

1. Two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, and individual aluminum-foil/polyester-tape shielded pairs with 100 percent shield coverage; PVC jacket.

2. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
3. NFPA 70, Type CM.
4. Flame Resistance: UL 1581 vertical tray.

C. TIA 485-A Cables: Two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70, Type CMG.

D. Multiconductor, Reader Cables:

1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.
4. For TIA 232-F applications.

E. Paired, Lock Cables:

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.

F. Paired, Input Cables:

1. One pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, overall aluminum-foil/polyester-tape shield with No. 22 AWG, stranded (7x30) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMR.
3. Flame Resistance: UL 1666 riser flame test.

G. Paired, AC Transformer Cables:

1. One pair, twisted, No. 18 AWG, stranded (7x26) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.

H. LAN Cabling:

1. Comply with NFPA 262.

2.05 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.

PART 3 : EXECUTION

3.01 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA/EIA 606-A, "Administration Standard for Commercial Telecommunications Infrastructure."

3.03 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Wiring Method: Install wiring in raceway or provide armored cables.

C. Install LAN cables using techniques, practices, and methods that are consistent with Category 5E rating of components and fiber-optic rating of components, and that ensure Category 6 and fiber-optic performance of completed and linked signal paths, end to end.

D. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

E. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.04 CABLE APPLICATION

A. Comply with TIA 569-B, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 feet.

D. TIA 485-A Cabling: Install at a maximum distance of 4,000 feet.

E. Card Readers:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless the manufacturer recommends larger conductors, install No. 22 AWG wire if the maximum distance from controller to the reader is 250 feet, and install No. 20 AWG wire if maximum distance is 500 feet.
3. For greater distances, install "extender" or "repeater" modules recommended by the manufacturer of the controller.
4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed 250 feet.

G. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of 25 feet.

3.05 GROUNDING

A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

B. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Bond shields and drain conductors to ground at only one point in each circuit.

D. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.06 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in TIA/EIA 606-A.

B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.

2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

C. At completion, cable and asset management software shall reflect as-built conditions.

3.07 FIELD QUALITY CONTROL

A. Perform Tests and Inspections:

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA 568-B.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA 568-B.1.

2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.

3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.08 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.

END OF SECTION 28 13 00

SECTION 31 23 43
EARTHWORK

PART 1 : GENERAL

1.01 SUMMARY

A. This Section includes:

1. Structure excavation and backfilling necessary for the construction of all structures associated with the project.
2. Excavation of earthwork of whatever consistency encountered.
3. Over-excavation of materials as directed by the City.
4. Handling of excavated materials and associated cleanup.
5. Providing and placing various fill materials in accordance with the Contract Documents.
6. Compacting existing and imported materials suitable for the contemplated loadings.

1.02 REFERENCES

A. ASTM Standards

1.	C33	Standard Specification for Concrete Aggregates
2.	C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
3.	C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
4.	D1241	Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses, with Gradation Requirements modified per this Specification
5.	D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3(2,700 kN-m/m))
6.	D3786	Standard Test Method for Bursting Strength of Textile Fabrics--Diaphragm Bursting Strength Tester Method
7.	D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
8.	D4254	Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
9.	D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

10. D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. Standard Specifications for Road, Bridge, and Municipal Construction, latest edition, by the Washington State Department of Transportation.

1.03 QUALITY ASSURANCE

A. Registered professional engineer licensed in the State of Washington for design of shoring systems or other excavation safety plans in accordance with Section 31 41 00 - Excavation Support Systems.

1.04 DEFINITIONS

A. Excavation: All excavation will be defined as unclassified.

1.05 SUBMITTALS

A. Submit the following:

1. Product technical data including:
    a. Acknowledgement that products submitted meet requirements of standards referenced.
    b. Manufacturer's installation instructions.
2. Certifications.
3. Test Reports:
    a. Sieve analysis for all borrow materials in accordance with ASTM C136.
    b. Laboratory density test data (maximum modified proctor) in accordance with ASTM D1557 on all materials subject to compaction testing.
    c. Material source data.
    d. If the source or quality of any materials changes during construction, the Contractor shall furnish additional test reports to the Owner for review and acceptance prior to the use of the different material.
4. If dewatering is necessary, the Contractor shall submit a Construction Dewatering Plan to the Engineer at least 14 calendar days before dewatering. The Dewatering Plan shall include:
    a. Details regarding method, installation, and construction of the dewatering system including:
        1) Numbers and types of equipment.
        2) Anticipated and potential effects on adjacent structures and properties.
        3) Depth, locations, and conveyance capacity of equipment.

4) Water discharge locations.

5) Necessary permits and requirements for water discharge.

6) An estimate of advance time to dewater the excavation prior to work in the excavation when necessary.

7) Such other information to verify acceptable control and performance.

b. The Dewatering Plan shall be prepared by a licensed professional hydrogeologist or engineer and shall be reviewed by Engineer before Contractor begins excavation.

PART 2 : PRODUCTS

2.01 MATERIALS

A. Structural Backfill:

1. As indicated on the Drawings.

a. Gravel Borrow: in accordance with Section 9-03.14(1) of the Standard Specifications or the COE Gravel Borrow. During wet weather construction, the amount of fines (material passing a U.S. No. 200 sieve) shall not exceed 5 percent by dry weight, based on a wet sieve analysis of that portion passing the No. 4 sieve.

b. Lean concrete as specified in the COE Design and Construction Standards.

B. Foundation Material:

1. As indicated on the Drawings.

a. Foundation Material, Class A: in accordance with Section 9-03.17 of the Standard Specifications.

b. Cellular Concrete Backfill as specified in Section 03 31 16.

C. Crushed Surfacing Base Course (CSBC): In accordance with Section 9-03.9(3) of the Standard Specifications.

D. Crushed Surfacing Top Course (CSTC): In accordance with Section 9-03.9(3) of the Standard Specifications.

E. Gravel Backfill for Drains: In accordance with Section 9-03.12(4) of the Standard Specifications.

F. Geotextile Filter Fabric:

1. Nonwoven type.

2. Equivalent opening size: 50-100 (U.S. Standard Sieve).

3. Permeability coefficient (cm/second): 0.07 minimum, 0.30 maximum.

4. Grab Strength: 90 LBS minimum in either direction in accordance with ASTM D4632 requirements.
5. Mullen Burst Strength: 125 psi minimum in accordance with ASTM D3786 requirements.

PART 3 : EXECUTION

3.01 PROTECTION

A. Protect existing surface and subsurface features on-site and adjacent to site as follows:

1. Provide barricades, coverings, or other types of protection necessary to prevent damage to existing items indicated to remain in place.
2. Protect and maintain benchmarks, monuments or other established reference points and property corners:
    a. If disturbed or destroyed, replace in accordance with WAC 332-120 at own expense to full satisfaction of Owner and controlling agency.
3. Verify Location of Utilities:
    a. Omission or inclusion of utility items does not constitute nonexistence or definite location.
    b. Secure and examine local utility records for location data.
    c. Take necessary precautions to protect existing utilities from damage due to any construction activity. Service lines from the main utility may not be shown on the Drawings. Contractor shall anticipate the need to work around these service lines.
    d. Repair damages to utility items at own expense.
    e. In case of damage, notify Engineer and affected utility company at once so that required protective measures may be taken.
4. Maintain free of damage, existing sidewalks, structures, and pavement, not indicated to be removed:
    a. Any item known or unknown or not properly located that is inadvertently damaged shall be repaired to original condition.
    b. All repairs to be made and paid for by Contractor.
5. Provide full access to public and private premises, fire hydrants, street crossings, sidewalks and other points as designated by Owner to prevent interruption of travel.
6. Maintain stockpiles and excavations in such a manner to prevent inconvenience or damage to structures on-site or on adjoining property.
7. Avoid surcharge or excavation procedures which can result in heaving, caving, or slides.

B. Salvageable Items: Carefully remove items to be salvaged, and store on Owner's premises unless otherwise directed.

C. Dispose of waste materials, legally, off site:

1. Burning, as a means of waste disposal, is not permitted.

3.02 SITE EXCAVATION AND GRADING

A. The work includes all operations in connection with excavation, borrow, construction of fills and embankments, rough grading, and disposal of excess materials in connection with the preparation of the site(s) for construction of the proposed facilities.

B. Excavation and Grading:

1. Perform as required by the Drawings.
2. Drawings may indicate both existing grade and finished grade required for construction of Project:
    a. Stake all units, structures, piping, roads, parking areas and walks and establish their elevations.
    b. Perform other layout work required.
    c. Replace property corner markers to original location if disturbed or destroyed.
3. Preparation of ground surface for embankments or fills:
    a. Before fill is started, scarify to a minimum depth of 6 IN in all proposed embankment and fill areas.
    b. Where ground surface is steeper than one vertical to four horizontal, plow surface in a manner to bench and break up surface so that fill material will bind with existing surface.
4. Protection of finish grade:
    a. During construction, shape and drain embankment and excavations.
    b. Maintain ditches and drains to provide drainage at all times.
    c. Protect graded areas against action of elements prior to acceptance of work.
    d. Reestablish grade where settlement or erosion occurs.

C. Borrow:

1. Provide necessary amount of approved fill compacted to density at least equal to that indicated in this Section.
2. Include cost of all borrow material in original proposal.
3. Fill material to be approved by Engineer prior to placement.

D. Construct embankments and fills as required by the Drawings:

1. Construct embankments and fills at locations and to lines of grade indicated:

   a. Completed fill shall correspond to shape of typical cross section or contour indicated regardless of method used to show shape, size, and extent of line and grade of completed work.

2. Provide approved fill material which is free from roots, organic matter, trash, frozen material, and stones having maximum dimension greater than 4 IN:

   a. Ensure that stones larger than 4 IN are not placed in upper 6 IN of fill or embankment.

   b. Do not place material in layers greater than 8 IN loose thickness.

   c. Place layers horizontally and compact each layer prior to placing additional fill.

3. Compact by sheepsfoot, pneumatic rollers, vibrators, or by other equipment as required to obtain specified density:

   a. Control moisture for each layer necessary to meet requirements of compaction.

3.03 USE OF EXPLOSIVES

A. Blasting with any type of explosive is prohibited.

3.04 FIELD QUALITY CONTROL

A. The Owner will retain a qualified independent testing laboratory to perform the laboratory and field tests.

B. Do not include in bid price the cost of inspection services indicated herein as being performed by the independent testing laboratory.

C. Moisture density relations, to be established by the independent testing laboratory, are required for all materials to be compacted.

D. Extent of compaction testing will be as necessary to assure compliance with specifications.

E. Give minimum of 24 HR advance notice to Engineer when ready for compaction or subgrade testing and inspection.

F. Should any compaction density test or subgrade inspection fail to meet specification requirements, perform corrective work as necessary.

G. Pay for all costs associated with corrective work and retesting resulting from failing compaction density tests.

3.05 COMPACTION DENSITY REQUIREMENTS

A. Obtain approval from Engineer with regard to suitability of soils and acceptable subgrade prior to subsequent operations.

B. Provide dewatering system necessary to successfully complete excavation, compaction and construction requirements.

C. Remove frozen, loose, wet, or soft material and replace with approved material as directed by Engineer.

D. Stabilize subgrade with well graded granular materials as directed by Engineer.

E. Assure by results of testing that compaction densities comply with the following requirements:

1. Sitework:

Location	**Compaction Density**
Under Paved Areas, Sidewalks and Piping:	95 percent per ASTM D1557
Unpaved Areas	90 percent per ASTM D1557

2. Structures:

Location	**Compaction Density**
Inside of structures under foundations, under equipment support pads, under slabs-on-grade and scarified existing subgrade under fill material	95 percent per ASTM D1557
Outside structures next to walls, piers, columns and any other structure exterior member	90 percent per ASTM D1557

3. Specific areas:

Location	**Compaction Density**
Outside structures under equipment support foundations	95 percent per ASTM D1557

3.06 EXCAVATION, FILLING, AND BACKFILLING FOR STRUCTURES

A. General:

1. In general, work includes, but is not necessarily limited to, excavation for structures and retaining walls, removal of underground obstructions and undesirable material, furnishing and placing fill and backfill, and compaction of subgrade and backfill.

2. Obtain fill and backfill material necessary to produce grades required:
    a. Materials and source to be approved by Engineer.
3. In this Section, the word "foundations" includes footings, base slabs, foundation walls, mat foundations, grade beams, piers and any other support placed directly on soil.
4. In the paragraphs of this Section, the word "soil" also includes any type of rock subgrade that may be present at or below existing subgrade levels.

B. Excavation Requirements for Structures:

1. General:
    a. Do not commence excavation for foundations for structures until Engineer approves:
        1) The removal of topsoil and other unsuitable and undesirable material from existing subgrade.
        2) Density and moisture content of site area compacted fill material meets requirements of specifications.
        3) Site surcharge or mass fill material can be removed from entire construction site or portion thereof.
        4) Surcharge or mass fill material has been removed from construction area or portions thereof.
    b. Engineer grants approval to begin excavations.
2. Dimensions:
    a. Excavate to elevations and dimensions indicated or specified.
    b. Allow additional space as required for construction operations and inspection of foundations.
3. Removal of obstructions and undesirable materials in excavation includes, but is not necessarily limited to, removal of old foundations, existing construction, unsuitable subgrade soils, expansive type soils, and any other materials which may be concealed beneath present grade, as required to execute work indicated on Drawings:
    a. If undesirable material and obstructions are encountered during excavation, remove material and replace as directed by Engineer.
4. Level off bottoms of excavations to receive foundations, floor slabs, equipment support pads, or compacted fill:
    a. Remove loose materials and bring excavations into approved condition to receive concrete or fill material.
    b. Where compacted fill material must be placed to bring subgrade elevation up to underside of construction, compact existing subgrade to density stated in this Section before fill material is placed thereon.
    c. Do not carry excavations lower than shown for foundations except as directed by Engineer.

d. If any part of excavations is carried below required depth without authorization, maintain excavation and start foundation from excavated level with concrete of same strength as required for superimposed foundation, and no extra compensation will be made to Contractor, therefore.

5. Make excavations large enough for working space, forms, dampproofing, waterproofing, and inspection.

6. Notify Engineer as soon as excavation is completed in order that subgrades may be inspected:

   a. Do not commence further construction until subgrade under compacted fill material, under foundations, under floor slabs-on-grade, under equipment support pads, and under retaining wall footings has been inspected and approved by the Engineer as being free of undesirable material, being of compaction density required by this specification, and being capable of supporting the allowable foundation design bearing pressures and superimposed foundation, fill, and building loads to be placed thereon.

   b. Engineer shall be given the opportunity to inspect subgrade below fill material both prior to and after subgrade compaction.

   c. Place fill material, foundations, retaining wall footings, floor slabs-on-grade, and equipment support pads as soon as weather conditions permit after excavation is completed, inspected, and approved and after forms and reinforcing are inspected and approved.

   d. Before concrete or fill material is placed, protect approved subgrade from becoming loose, wet, frozen, or soft due to weather, construction operations, or other reasons.

7. If dewatering is necessary, the following apply:

   a. The Contractor is fully responsible for controlling groundwater.

   b. Excavations shall be kept free of water as necessary to advance the project and maintain safe working conditions.

   c. The Contractor shall control surface run-off so as to prevent entry or collection of water in excavations.

   d. The control of groundwater shall prevent softening of the bottom of excavations, or formations of “quick” or heaving conditions, or “boils”.

   e. Dewatering systems shall be designed and operated so as to prevent any removal or flowing of native soils or previously placed fill soils.

   f. In the event the subgrade is compromised as a result of the Contractor’s dewatering methods, the Contractor shall be fully responsible for restoring the integrity of the subgrade to the satisfaction of the Engineer.

g. Disposal of the water shall not cause injury to public or private property, or nuisance to the public, or degradation of the natural or built environment.

h. Sufficient pumping and power equipment in good working condition shall be available at all times for all emergencies, including power outage, and competent personnel shall be available at all times for the operation of the dewatering system.

i. Water discharge locations shall comply with required permits from City of Everett, other local jurisdictions, State and Federal agencies as appropriate.

j. The Contractor shall discharge dewatering water in accordance with city, county, and state regulations and any other applicable project permits. No sediment shall present in the discharge water and the discharge volume/rate shall be within the permit's allowable capacity. All sediment removal measures shall be at the Contractor's expense.

k. If sediment laden water is being discharged, the Contractor shall immediately cease dewatering discharge upon notification by the City or Engineer. The Contractor shall anticipate that the dewatering discharge may have to be discontinued for a period of time, especially during wet weather conditions. No claim may be made if the conditions require that the dewatering discharge be temporarily discontinued.

l. The Contractor shall do whatever is necessary to eliminate or minimize sediment transport during dewatering operations. If sediments or solids are present in the dewatering water, the Contractor shall employ best management practices to remove settleable and suspended solids as required to meet permit or water quality requirements.

m. The dewatering system shall be designed to prevent loss of foundation support to adjacent structure, underground installation, improvement, or the sides of an excavation. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not drawn down to the extent that would damage or endanger adjacent structure, underground installation, sidewalk, pavement, other improvement, or property. The Contractor shall assume a maximum tolerable lowering of the site groundwater table of 1 foot, measured as a radial distance of 30 feet from the excavation limits, or the distance to any existing residential structure, whichever is less.

n. The groundwater table shall be lowered to a minimum of 2 feet below the bottom of any excavation.

o. The return of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils and supported soils, prevent disturbance of compacted bedding and backfill, and prevent flotation or movement of structures and utilities.

p. Keep dewatering system in operation until dead load of structure exceeds possible buoyant uplift force on structure.

8. Subgrade Stabilization:

   a. If subgrade under foundations, fill material, floor slabs-on-grade, or equipment support pads is in a frozen, loose, wet, or soft condition before construction is placed thereon, remove frozen, loose, wet, or soft material and replace with approved Foundation Material as directed by Engineer.

   b. Provide compaction density of replacement material as stated in this Section.

   c. Method of stabilization shall be performed as directed by Engineer.

   d. Do not place further construction on the repaired subgrades, until the subgrades have been approved by the Engineer.

9. Do not place floor slabs-on-grade including equipment support pads until subgrade below has been approved, piping has been tested and approved, reinforcement placement has been approved, and Contractor receives approval to commence slab construction.

   a. Do not place building floor slabs-on-grade including equipment support pads when temperature of air surrounding the slab and pads is or is expected to be below 40 DegF until structure is completed and heated to a temperature of at least 50 DegF.

10. Protection of Structures:

    a. Prevent new and existing structures from becoming damaged due to construction operations or other reasons.

    b. Prevent subgrade under new and existing foundations from becoming wet and undermined during construction due to presence of surface or subsurface water or due to construction operations.

11. Shoring:

    a. Provide Excavation Support Systems in accordance with Section 31 41 00.

    b. Shore, sheet pile, slope, or brace excavations as required to prevent them from collapsing.

    c. Remove shoring as backfilling progresses but only when banks are stable and safe from caving or collapse.

12. Drainage:

    a. Control grading around structures so that ground is pitched to prevent water from running into excavated areas or damaging structures.

    b. Maintain excavations free of water where foundations, floor slabs, equipment support pads or fill material are to be placed.

c. Provide pumping required to keep excavated spaces clear of water during construction.

d. Should any water be encountered in the excavation, notify Engineer.

e. Provide free discharge of water by trenches, pumps, wells, well points, or other means as necessary and drain to point of disposal that will not damage existing or new construction or interfere with construction operations.

13. Frost Protection:

a. Do not place foundations, slabs-on-grade, equipment support pads, or fill material on frozen ground.

b. When freezing temperatures may be expected, do not excavate to full depth indicated, unless foundations, floor slabs, equipment support pads, or fill material can be placed immediately after excavation has been completed and approved.

c. Protect excavation from frost if placing of concrete or fill is delayed.

d. Where a concrete slab is a base slab-on-grade located under and within a structure that will not be heated, protect subgrade under the slab from becoming frozen until final acceptance of the Project by the Owner.

e. Protect subgrade under foundations of a structure from becoming frozen until structure is completed and heated to a temperature of at least 50 DegF.

C. Fill and backfill inside of structure and below foundations, base slabs, floor slabs, equipment support pads and piping:

1. General:

a. Subgrade to receive fill or backfill shall be free of undesirable material as determined by Engineer and compacted to density specified herein.

b. Surface may be stepped by at not more than 12 IN per step or may be sloped at not more than 2 percent.

c. Do not place any fill or backfill material until subgrade under fill or backfill has been inspected and approved by Engineer as being free of undesirable material and compacted to specified density.

2. Obtain approval of fill and backfill material and source from Engineer prior to placing the material.

3. Granular fill under floor slabs-on-grade: Place all floor slabs-on-grade on a minimum of 6 IN of granular fill unless otherwise indicated.

4. Fill and Backfill Placement:

a. Prior to placing fill and backfill material, optimum moisture and maximum density properties for proposed material shall be obtained from Engineer.

b. Place fill and backfill material in 6 IN maximum compacted thickness lifts as necessary to obtain required compaction density. 12 IN compacted thickness lifts may be used if Contractor proves the required compaction density is being obtained.

c. Compact material by means of equipment of sufficient size and proper type to obtain specified density.

d. Use hand operated equipment for filling and backfilling next to walls.

e. Do not place fill and backfill when the temperature is less than 40 DegF and when subgrade to receive fill and backfill material is frozen, wet, loose, or soft.

f. Use vibratory equipment to compact granular material; do not use water.

5. Where fill material is required below foundations, place fill material, conforming to the required density and moisture content, outside the exterior limits of foundations located around perimeter of structure as shown on the Drawings or the following horizontal distance whichever is greater:

a. As required to provide fill material to indicated finished grade.

b. 5 FT.

c. Distance equal to depth of compacted fill below bottom of foundations.

d. As directed by Engineer.

D. Filling and Backfilling Outside of Structures:

1. This paragraph of this Section applies to fill and backfill placed outside of structures above bottom level of both foundations and piping but not under paving.

2. Provide material as approved by Engineer for filling and backfilling outside of structures.

3. Fill and Backfill Placement:

a. Prior to placing fill and backfill material, obtain optimum moisture and maximum density properties for proposed material from Engineer.

b. Place fill and backfill material in 6 IN compacted thickness lifts as necessary to obtain required compaction density. 12 IN compacted thickness lifts may be used if Contractor proves the required compaction density is being obtained.

c. Compact material with equipment of proper type and size to obtain density specified.

d. Use only hand operated equipment for filling and backfilling next to walls and retaining walls.

e. Do not place fill or backfill material when temperature is less than 40 DegF and when subgrade to receive material is frozen, wet, loose, or soft.

f. Use vibratory equipment for compacting granular material; do not use water.

4. Backfilling against walls:

a. Do not backfill around any part of structures until each part has reached specified 28-day compressive strength and backfill material has been approved.

b. Do not start backfilling until concrete forms have been removed, trash removed from excavations, pointing of masonry work, concrete finishing, dampproofing and waterproofing have been completed.

c. Do not place fills against walls until floor slabs at top, bottom, and at intermediate levels of walls are in place and have reached 28-day required compressive strength to prevent wall movement.

d. Bring backfill and fill up uniformly around the structures and individual walls, piers, or columns.

E. Backfilling Outside of Structures Under Piping or Paving:

1. When backfilling outside of structures requires placing backfill material under piping or paving, the material shall be placed from bottom of excavation to underside of piping or paving at the density required for fill under piping or paving as indicated in this Section.

2. This compacted material shall extend transversely to the centerline of piping or paving a horizontal distance each side of the exterior edges of piping or paving equal to the depth of backfill measured from bottom of excavation to underside of piping or paving.

3. Provide special compacted bedding or compacted subgrade material under piping or paving as required by other Sections for the Project.

END OF SECTION 31 23 43

SECTION 31 25 14
SOIL EROSION AND SEDIMENT CONTROL

PART 1 : GENERAL

1.01 SUMMARY

A. This Section includes:

1. Soil erosion and sediment control.
2. Implement soil erosion and sediment control as specified in Standard Specifications Section 8-01, City of Everett Design and Construction Standards, City of Everett Standard Drawing 210 and these specifications.

1.02 REFERENCES

A. Erosion Control Standards: Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas by the United States Department of Agriculture (USDA), Soil Conservation Service, College Park, Maryland.

B. Standard Specifications for Road, Bridge, and Municipal Construction, latest edition by the Washington State Department of Transportation.

1.03 QUALITY ASSURANCE

A. Designate and have a Certified Erosion and Sediment Control Lead (CESCL) onsite at all times.

PART 2 : PRODUCTS

2.01 MATERIALS

A. Grass Seed: Annual ryegrass.

B. Filter Fabric Fence: Conform to Section 8-01.3(9)A of the Standard Specifications and City of Everett Standard Drawing 214.

C. Catch Basin Inserts: Conform to Section 8-01.3(9)D of the Standard Specifications and City of Everett Standard Drawing 210. Inserts shall have straps to facilitate removal and cleaning of inserts and shall have a minimum storage capacity of 0.5 cf. Inlet and grate covers are not allowed.

D. Silt Dikes: Conform to Section 8-01 of the Standard Specifications.

E. Fiber Rolls: Conform to Section 8-01 of the Standard Specifications.

F. Sandbags: Conform to Section 8-01 of the Standard Specifications.

G. Mulch shall be wood cellulose fiber with guar gum or accepted equal as a soil binder.

PART 3 : EXECUTION

3.01 PREPARATION

A. Prior to beginning earthwork activities, install catch basin inserts, filter fabric fence, fiber rolls, and other erosion control measures as necessary and where shown on the Drawings.

B. Provide swales and dikes to direct runoff towards sediment traps and filter fabric fencing.

C. Temporary erosion and sedimentation control measures shall be in place and functional before land disturbing activities take place.

3.02 DURING CONSTRUCTION PERIOD

A. Maintain erosion and sedimentation control measures:

1. Inspect regularly, especially after rainstorms.
2. Repair, augment, or replace damaged or missing items.

B. After rough grading, sow temporary grass cover over all exposed earth areas not draining to sediment trap of filter fabric fencing.

C. Do not disturb existing vegetation (grass and trees):

1. Contractor shall over-seed areas at a rate of 5 pounds per 1,000 square feet where Contractor's actions have compromised the erosion and sedimentation control functions of the existing grasses.
2. Unpaved areas subsequently disturbed by the Contractor's operations shall be reseeded.

D. Excavate sediment from traps and catch basin inserts, when capacity has been reduced by 50 percent:

E. Remove accumulated sediment from behind filter fabric fencing to allow passage of runoff.

F. All construction areas shall be properly protected and stabilized with erosion and sedimentation control measures as construction progresses.

3.03 NEAR COMPLETION OF CONSTRUCTION

A. Remove filter fabric fencing, swales, dikes, sediment traps, etc.

B. Grade to finished or existing grades.

C. Fine grade all remaining earth areas, then seed and mulch unpaved areas that were disturbed.

D. Gravel areas around the new building as shown on the Drawings and in accordance with Section 31 23 43 - Earthwork of these Specifications.

E. Clean catch basins and storm water conveyance piping.

END OF SECTION 31 25 14

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SECTION 31 41 00
EXCAVATION SUPPORT SYSTEMS

PART 1 : GENERAL

1.01 SUMMARY

A. This Section includes requirements for cribbing and shoring to be used for demolition, structural excavations, and trench safety.

1.02 REFERENCES

A. WAC 296-155 – Safety Standards for Construction Work.

B. RCW Chapter 39.04.180 – Public Works/Trench Excavations – Safety Systems Required.

C. RCW Chapter 49.17 – Washington Industrial Safety & Health Act.

D. Standard Specifications for Road, Bridge, and Municipal Construction, latest edition by the Washington State Department of Transportation.

1.03 SUBMITTALS

A. Submit the following:

1. Certification that all excavation support system design work has been performed under the direction of a professional engineer licensed by the State of Washington.
2. Structural shoring design and support calculations for all shoring system that will be used for this project. The shoring design shall be stamped by a professional engineer licensed in the State of Washington.
3. Shoring contractor qualifications.

B. Informational Submittals:

1. Trench shield (trench box) certification if employed:
    a. Specific to Project conditions.
    b. Re-certified if members become distressed.
    c. Certification by registered professional structural engineer, registered in the State of Washington.
    d. Engineer is not responsible to, and will not, review and approve.
2. Trench safety plan and/or trench shoring drawings:
    a. Trench Safety Plan and/or trench shoring drawings submittal is required only as evidence that a safety plan and drawings have been prepared if required by authorities having jurisdiction.
    b. Engineer or Owner is not responsible to, and will not, approve.

1.04 QUALITY ASSURANCE

A. The shoring contractor shall:

1. Specialize in earth retention/construction as its primary business.
2. Be fully experienced and properly qualified, licensed, equipped, organized and financed to perform the shoring and excavation support work.
3. Have successfully completed at least five projects of similar scope and shoring/earth retention requirements in similar soil and groundwater conditions in the last five (5) years.

1.05 SYSTEM REQUIREMENTS

A. All cribbing, sheeting, and shoring shall be designed by a qualified person and meet the requirements of WAC 296-155.

B. The Contractor shall be exclusively responsible for providing the services of the competent person and registered professional engineer, as referenced in WAC 296-155-650, relating to excavation, trenching, and shoring. Representatives of the Owner and Engineer shall not be required to perform the roles of competent person or registered professional engineer as defined in WAC 296-155-650.

C. Adequate sheeting, shoring, bracing, sloping, or other methods of sustaining the stability of the floor and walls of the excavation and minimize the impacts to site groundwater levels shall be utilized as necessary to support the excavation under loading conditions that exist or arise during construction.

D. Means and methods shall protect and not adversely impact the structures or facilities, existing or constructed, and not interrupt the operations/functions of the structures or facilities.

E. Adequate excavation support/shoring and groundwater control measures shall be utilized to minimize lowering of groundwater outside of the excavations due to high risk of ground subsidence.

F. Installation and removal of the excavation support system shall not produce significant vibrations that could adversely impact the integrity of the structures and its functions/operations, or ground subsidence.

PART 2 : PRODUCTS

Not Used.

PART 3 : EXECUTION

3.01 CRIBBING, SHEETING, AND SHORING

A. Install and maintain shoring (including ground freezing), sheeting, bracing, and sloping necessary to support the sides of the excavation and to prevent any movement that may damage adjacent facilities, delay the work, or endanger life and health. Conform to the requirements of Washington Industrial Safety and Health Act (WISHA) and other applicable governmental regulations and agencies.

B. The Contractor shall be solely responsible for making and maintaining all excavations in a safe manner.

C. Proper design and installation of the shoring systems, method of construction, and monitoring and protection of the structure excavations, shoring, and existing structures and facilities are the responsibility of the Contractor. Monitoring shall be conducted daily. The Contractor shall ensure the integrity of existing structures and facilities are maintained and that appropriate construction techniques are employed at all times to protect existing, as well as newly installed, structures and facilities. In the event shoring becomes unstable or noticeable surface/structural settlements or movements occurs, Contractor shall immediately implement corrective measures and notify the Owner. Contractor shall be solely liable for any and all shoring systems necessary to support the excavations under any and all loading conditions that may exist or arise during construction.

D. Use any combination of shoring and overbreak, sliding trench shield, or other method allowed by the applicable local, state, and federal safety codes.

E. Carefully reconsolidate the bedding and side support behind a movable box prior to placing backfill.

F. Sheet piling and timbers in trench and other excavations shall be installed and withdrawn in a manner so as to prevent subsequent settlement of structures or pipe, or additional backfill loading that might overload the pipe. Reconsolidate bedding/backfill to the satisfaction of the Owner.

G. Where shoring or movable trench shields extend below the top of a pipe and are to be removed, locate at least one pipe diameter away from the pipe. They may be located closer only if Contractor demonstrates to Owner’s satisfaction a means of reconsolidation.

H. If a movable box is used in lieu of cribbing or sheeting, and the bottom cannot be kept above the spring line of the pipe, the bedding or side support shall be carefully reconsolidated behind the movable box prior to placing initial backfill.

I. Where removal of sheeting would result in damage to adjacent utilities or other property, Engineer may order all or a portion of sheeting to be cut off and left in place.

J. Do not use horizontal strutting below the barrel of a pipe.

K. Do not use the pipe as support for trench bracing.

L. Damages resulting from improper shoring and failure to shore shall be the sole responsibility of the Contractor.

3.02 TRENCH EXCAVATION SAFETY SYSTEMS

A. Protect all utility trench excavation more than 4 feet in depth with a safety system conforming to the referenced requirements.

B. The Contractor's trench safety system shall be designed by a qualified person and meet the referenced requirements.

3.03 PAYMENT

A. All costs associated with providing, installing, and maintaining adequate excavation support systems as specified herein shall be included in and paid under bid item "Trench Excavation Safety Systems".

END OF SECTION 31 41 00

SECTION 40 05 07
PIPING AND MECHANICAL EQUIPMENT SUPPORT

PART 1 : GENERAL

1.01 SUMMARY

A. Design and provide:

1. Pipe hangers and supports.
2. Equipment bases and supports.
3. Seismic protection of piping and equipment.

B. This Section described minimum requirements and does not consider seismic loadings. Refer to Section 13 53 00 - Seismic Restraint Requirements for Non-Structural Components for the seismic restraint requirements for non-structural components.

1.02 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Manufacturer's technical data for all hangers, brackets, supports and documentation of conformance with appropriate standards and these specifications.
2. Detailed drawings showing the locations of the proposed pipe supports, and the type of structural and pipe attachments. Drawings shall be provided for each piping system.
3. Shop drawings and calculations shall be prepared by a professional engineer licensed to practice as in the State of Washington, and experienced in the area of seismic force restraints. The structural engineer shall be hired by and paid for by the Contractor.

1.03 REFERENCES

A. All materials and methods shall conform to the latest, applicable requirements of documents listed hereafter. Unless otherwise specified, references to documents shall mean the documents in effect at the time of the effective date of the Agreement. If reference documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization. In case of conflict between this Section and the listed documents, the requirements of this Section shall prevail.

1. ANSI A13.1 Piping and Piping System
2. ANSI B31.1 Power Piping
3. SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems

1.04 DELIVERY, STORAGE, AND HANDLING

A. Exercise care in transporting and handling to avoid damage to material.

B. Store materials on the site to prevent damage or theft.

C. Keep materials clean, dry, and free from deleterious conditions.

D. Do not store materials directly on the ground.

E. Repair or replace damaged material or equipment to the satisfaction of the Project Manager.

F. Protect electrical equipment, controls, and insulation against moisture and water damage.

G. The Contractor shall be responsible for equipment included in this Contract until it has been inspected, tested, and accepted in accordance with the requirements of these Specifications.

PART 2 : PRODUCT

2.01 GENERAL

A. The Contractor shall design, provide, and install pipe support systems which include hangers, brackets, supports, anchors, expansion joints, and structural attachments. The support system shall be pipe rack, trapeze pipe hangers or individual pipe clamps, hangers, supports and structural attachments as specified herein. The support system shall be provided in conjunction with the pipe to be supported. Seismic restraints shall be provided in accordance with SMACNA Manual and per the requirements of Section 13 53 00.

B. In certain locations, pipe supports, anchors, and expansion joints have been indicated on the drawings, but no attempt has been made to indicate every pipe support, anchor, and expansion joint. It shall be the Contractor's responsibility to design and provide a complete system of pipe supports.

C. Pipe supports and anchor bolts for submerged and outdoor piping shall be 316 stainless steel.

2.02 ACCEPTABLE MANUFACTURERS

A. Anvil

B. Erico

C. Grabler

D. Fee & Mason

E. Unistrut

F. Superstrut,

G. Or approved equal.

2.03 PIPE RACKS AND TRAPEZE HANGERS

A. Pipe racks and trapeze hangers shall be constructed of galvanized steel channels, rods, posts, post base, clamps, brackets, fittings, and accessories, except where indicated otherwise on the drawings. All components for pipe rack and trapeze shall be Unistrut or approved equal.

2.04 PIPE CLAMPS AND HANGERS

A. In areas where pipe racks and trapezes are not used, pipe shall be supported with clamp hanger and stanchion saddle support system. The clamps and hangers shall be fastened to threaded rods hanging from structural attachments. Pipe supports shall be selected for the size and type of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item.

B. For indoor installation, all pipe supports, including pipe attachments, bolts, accessories, and appurtenances shall be galvanized steel, except where indicated otherwise.

C. For outdoor installation or for installation inside of wet well, process tanks (clarifiers and chlorine contact tanks), including submerged and non-submerged applications, all pipe supports including pipe attachments, bolts, accessories, and appurtenances shall be stainless steel, unless where indicated otherwise.

D. Pipe clamps and hangers shall be as manufactured by Grinnell or approved equal and shall be as follows:

Type	Pipe Size (in.)	Pipe Material	Grinnell Figure
Split ring	¾ to 8	all type	104
Split clamp	½ to 3	all type	138R
Adjustable ring	½ to 6	all type	97
Adjustable ring	½ to 4	copper	CT-269
Adjustable clevis	4 to 30	all type	260
Pipe clamp	4 to 18	all type	216
Socket clamp	4 to 24	cast iron	590
Stanchion saddle	4 to 12	all type	259
Adjustable saddle support	3 to 24	all type	264
Riser clamp	¾ to 24	all type	261 or 40
Adjustable pipe roll	6 to 12	stainless steel	174
Wall Bracket	—	all type	199

2.05 STRUCTURAL ATTACHMENTS

A. General:

1. Structural attachments shall be concrete insert channels or individual inserts for new concrete, surface-mounted channel or individual inserts for existing concrete or where applicable, steel roof plate supported attachments, complete with all accessories required.
2. All structural attachments including all accessories shall be galvanized steel for indoor use and stainless steel for outdoor use, for inside wet well, process tanks (clarifiers and chlorine contact tanks), and shall be provided by a single manufacturer. Structural attachments shall be as manufactured by Unistrut Corporation or approved equal.

B. Steel Structural Clamps:

1. Beam clamps, brackets, channel clamps, and bar joist clips select to suit structural system and meet loading recommendations of manufacturer.

C. Cast-in-Place Ceiling Inserts:

1. 3-inch and smaller pipe, Anvil Fig. 285.
2. 3½-inch and larger pipe, Anvil Fig. 281.
3. Multiple pipes on trapeze, Anvil Fig. 285 or Fig. 281, selected for maximum weight of piping.

D. Cast-in-Place Wall Inserts:

1. Unistrut P-3200 series inserts for concrete walls.
2. Unistrut P-1800 series inserts for brick walls.
3. Unistrut P-1000 channels with P-1045 and P-1047 fittings for frame and block walls.

E. Attachment into existing concrete or masonry wall: Self-drill type Red Head, Phillips Anchors or approved equal. Do not use powder driven inserts.

2.06 INTERMEDIATE ATTACHMENTS

A. Hanger Rods:

1. Continuous threaded steel rod; do not use chain, wire, or perforated strap.
2. Maximum hanger rod loading as follows:
   a. Rod Size, Maximum Load.

Diameter in Inches	Pounds
⅜	610
½	1130
⅝	1810
¾	2710
⅞	3770
1	4960

B. Trapeze Pipe Racks: Fabricate from structural angles or channels or Unistrut channels to suit weight of piping to be supported. Size for a minimum safety factor of 5.

C. Hanger Straps: Galvanized bar steel; ¾-inch wide by 18 gauge for 2½-inch and smaller pipe; ⅞-inch wide by 16 gauge for 3-inch to 4-inch pipe; 1⅛-inch wide by 12 gauge for 6-inch pipe size.

2.07 PIPE ATTACHMENTS

A. Pipe Rings:

1. Steel pipe and cast-iron soil pipe: 2-inch and smaller, adjustable ring Anvil #69. 2½-inch and larger, adjustable clevis Anvil #260.
2. Copper Pipe: 2-inch and smaller, adjustable ring Anvil #CT-69. 2½-inch and larger, adjustable clevis Anvil #CT-65.
3. Finish: Copper plated where ring encounters copper pipe; galvanized for contact with galvanized steel pipe; black for all other applications.
4. Application: Use only on piping systems where axial movement from thermal expansion is less than 1/2-inch.
5. For Hanger Straps: Elcen Figure 94 or Anvil Figure 97 with flattened-end bolt through cast iron socket; or hinged type, Modern Hanger Corporation No. 20, Elcen Figure 104, or Anvil Figure 108. Pipe rings shall be electro-galvanized, prime painted or cadmium-plated.

B. Channel-Type Pipe Clamp Assembly:

1. Channel-type pipe clamp assembly shall consist of a channel section, pipe clamp or clamps, and channel attachment bolts. The channel shall be Unistrut Corp, P1000, 15/8″ Single Channel. Material shall be steel, except stainless steel shall be used in the Chemical Room and Wet Well. Length shall be as required to accommodate the pipe clamp or clamps, and anchor bolts. Length shall be 12″ minimum.
2. The pipe clamp shall be Unistrut, P1100 Series (Conduit) or P2000 Series (Pipe). Material shall be steel, except stainless steel shall be used in the Chemical Room and Wet Well.

3. Anchor bolts shall be stainless steel, type as required for mounting surface. A minimum of two bolts shall be used for each channel. Bolt size shall be ½″ diameter.

C. Pipe Clamps:

1. Vertical piping: Unistrut P-1332 shelf bracket, Unistrut P-1100 channel, and Unistrut P-1100 series pipe clamps. Copper pipe clamps for copper pipe.
2. Horizontal racked piping: Unistrut P-1109 series or Unistrut P-2024C series clamps for Unistrut channel pipe racks.
3. Application: Use on piping systems without thermal expansion.

D. Vertical Pipe Supports:

1. Steel and iron pipe: Anvil #261 galvanized.
2. Plastic pipe: Anvil #261C.

2.08 EQUIPMENT BASES AND SUPPORTS

A. Concrete pads shall be 4” high. Pads shall extend 6-inches beyond machine base in all directions with ¾-inch top edge chamfered. Structural steel frame supports shall have all joints welded. Galvanize after fabrication.

2.09 PROTECTION SADDLES

A. Protection saddles shall be used for protecting pipe insulation against damage at pipe supports or as shown on the drawings. The nominal thickness of covering shall be the same as that of pipe insulation. The protection saddles shall be curved carbon steel plate and shall be Grinnell Figure 160 through Figure 162 or approved equal.

PART 3 : EXECUTION

3.01 DESIGN

A. Pipe support system shall be designed in accordance with applicable reference standards. Pipe supports shall be designed and selected to withstand seismic loads (refer to Drawings and Section 13 53 00, and shall adhere to the following:

1. Weight balance calculations shall be made to determine the required supporting force at each pipe support location and the pipe weight at each equipment location. Design loads for inserts, clamps, and other support items shall not exceed the manufacturer's recommended loads.
2. Pipe supports shall be able to support the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment. Allow clearances for pipe expansion and contraction.

3. Wherever possible, pipe attachments for horizontal and vertical piping shall be channel-type pipe clamp assemblies. Horizontal or vertical pipes should be supported preferably at locations of least vertical movement.

4. All pipe supports shall provide a means of vertical adjustment after erection.

5. Where practical, riser pipe shall be supported independently of the connected horizontal piping. Pipe support attachments to the riser piping shall be riser clamps.

6. When connected to equipment, piping and valves shall be supported not to impose any load on the equipment.

3.02 HANGER SPACING FOR PIPING

A. Horizontal ductile iron, and stainless-steel pipe: Maximum hanger spacing and minimum hanger rod diameters as follows:

½ and ¾-inch pipe	5-foot span	3/8-inch rod
1 and 1¼ -inch pipe	7-foot span	3/8-inch rod
1½-inch pipe	9-foot span	3/8-inch rod
2-inch pipe	10-foot span	3/8-inch rod
3, 4, 6, and 8-inch pipe	10-foot	5/8-inch rod
10-inch and larger pipe	10-foot	1/2-inch rod

B. Horizontal plastic pipe: Maximum hanger spacing and minimum hanger rod diameters as follows:

2-inch and smaller pipe	6-foot span	3/8-inch rod
2-inch and larger pipe	8-foot span	3/8-inch rod

C. Provide additional hangers or supports at concentrated loads such as valves, to maintain alignment and prevent sagging.

D. Vertical Piping Supports:

1. Support piping at each floor.

2. Provide intermediate supports to prevent excessive pipe movement.

E. Provide a minimum of 2 hangers per pipe section for grooved joint pipe.

F. Piping crossing over excavated and backfilled areas, provide precast concrete beam supported by the building structure and undisturbed earth.

3.03 INSTALLATION OF PIPE HANGERS AND SUPPORTS

A. Pipe support system shall be installed strictly in accordance with standards and codes, and recommendations of the piping support system manufacturer and piping manufacturer.

B. All piping shall be rigidly supported and anchored so that there is no movement or visible sagging between supports.

C. Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Supports for brass or copper pipe or tubing shall be copper plated. Those portions of pipe support which contact other dissimilar metals shall be rubber-or vinyl-coated.

D. Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead ending. Anchors shall be located as required to force expansion and contract movement to occur at expansion joints, loops, or elbows, and as required to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints.

E. Pipe supports, and expansion joints are not required in buried piping, but concrete thrust blocking or other approved anchorage shall be provided as indicated on the drawings or specified in other sections.

F. Provide piping supports and hangers with a means of adjustment for leveling, grading of piping and cold spring movements.

G. Provide sufficient hanger rod lengths to limit rod displacement from thermal expansion to 4 degrees from vertical.

H. Size pipe rings and clamps to pass around the outside of the piping insulation. Provide Anvil Fig. 160 pipe covering protection saddles at pipe rings where pipe insulation does not include a vapor barrier. Provide Anvil Fig. 167 insulation protection shields at pipe rings where pipe insulation includes a vapor barrier. Provide rigid inserts as required to prevent crushing of insulation.

I. Install vertical piping supports to allow for pipe movement due to thermal expansion and contraction.

J. Do not support pipe with other pipe.

K. Install steel backing in walls as required to support piping hung from steel stud walls.

L. Embed concrete inserts in new cast-in-place concrete. With concrete joist framing, place inserts at bottom of joists wherever possible. If closely spaced steel prevents such placement, provide Parker Kalon Type U-Drive screws and attach to sheet metal pan forms.

M. Provide bored, drilled, or reamed holes for all bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.

N. Install anchor bolts for all mechanical equipment and piping as required. Tightly fit and clamp base-supported equipment anchor bolts at all equipment support points. Provide locknuts where equipment is hung.

3.04 EQUIPMENT BASES AND SUPPORTS

A. Provide supports, pads, bases, and their attachments for mechanical work to be furnished or installed.

B. Provide concrete pads for pumps, compressors, other rotating mechanical machinery, boilers, expansion tanks, and for equipment where indicated on the drawings. Insert #4 6-inch-long steel dowel rods into floors to anchor pads.

C. Provide structural steel frame supports for equipment where indicated on drawings. Bolt to structure.

END OF SECTION 40 05 07

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SECTION 40 05 67
VALVES

PART 1 : GENERAL

1.01 SUMMARY

A. Valves for blower piping.

1.02 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Complete literature of manufacturer, described in full the characteristics of each item and its pertinent dimensions.

1.03 REFERENCES

A. All materials and methods shall conform to the latest, applicable requirements of documents listed hereafter. Unless otherwise specified, references to documents shall mean the documents in effect at the time of the effective date of the Agreement. If reference documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization. In case of conflict between this Section and the listed documents, the requirements of this Section shall prevail.

1.	ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings
2.	ANSI B16.5	Pipe Flanges and Flanged Fittings
3.	ASTM A126	Gray Iron Castings for Valves, Flanges and Pipe Fittings
4.	ASTM A436	Austenitic Gray Iron Castings
5.	ASTM A536	Ductile Iron Castings
6.	ASTM B62	Composition Bronze or Ounce Metal Castings
7.	ASTM B209	Aluminum and Aluminum-Alloy Sheet and Plate
8.	ASTM B371	Copper-Zinc-Silicon Alloy Rod
9.	ASTM B584	Copper Alloy Sand Castings for General Applications
10.	AWWA C504	Standard for Rubber Seated Butterfly Valves
11.	AWWA C508	Standard for Swing-check Valves for Ordinary Water Works Service
12.	AWWA C550	Protective Epoxy Interior Coatings for Valves and Hydrants
13.	API 609	American Petroleum Institute Specifications

1.04 DELIVERY, STORAGE, AND HANDLING

A. Exercise care in transporting and handling to avoid damage to material.

B. Store materials on the site to prevent damage or theft.

C. Keep materials clean, dry, and free from deleterious conditions.

D. Do not store materials directly on the ground.

E. Repair or replace damaged material or equipment to the satisfaction of the Project Manager.

F. Protect electrical equipment, controls, and insulation against moisture and water damage.

G. The Contractor shall be responsible for equipment included in this Contract until it has been inspected, tested, and accepted in accordance with the requirements of these Specifications.

PART 2 : PRODUCTS

2.01 GENERAL

A. Valves shall be manufacturer's standard design unless otherwise specified and shall be furnished with operating wheel, wrench nut, or lever as indicated. Unless otherwise indicated, the direction of rotation of the wheel, wrench nut, or lever to open the valve shall be counter-clockwise and shall have cast thereon the word OPEN. Unless otherwise required by the connecting piping, all 2½-inch or larger buried, embedded, and encased valves shall have non-threaded ends; 2-inch or smaller valves shall have threaded ends. Flanges shall conform to ANSI B16.5. Wafer-style valves, where allowed, shall be designed for installation between ANSI 125-pound flanges. A union, grooved-end connection, or other special connector allowing easy removal shall be provided within 2 feet of each threaded end valve unless the valve can be otherwise easily removed and such technique of removal is approved by the Engineer.

B. Valves of the same type shall be from a single manufacturer.

C. Cast-iron valve boxes extending to the finished or established ground or paved surfaces shall be provided for buried valves. They shall have suitable base castings to fit properly over the bonnets of their respective valves and heavy top sections with stay-put hinged covers. Boxes shall be of the screw or sliding type having 5¼-inch shaft diameter or greater. All parts of the valve boxes, bases, and covers shall be coated by dipping in hot bituminous varnish, except that part set in concrete shall be galvanized. Covers for boxes shall have cast thereon an appropriate name designating the service for which the valve is used. Valve boxes shall be set in a concrete pad as shown on the drawings, except where valve box is set in concrete sidewalk.

D. Buried valves, except gate valve, shall have position indicators in the valve box and wrench nut operator. Wrench nuts shall be provided on buried valves, on valves which are to be operated through floor boxes, and where shown. All wrench nuts shall comply with Section 20 of AWWA C500. Extend shafts to within 6 inches from grade, and support every 5 feet with the last support just below the operating nut. Five wrenches shall be supplied, each 3 feet 6 inches in length. Buried valves 4 inches and larger shall have 2-inch AWWA nut operator.

E. Manual operators shall be as required for each specific valve.

F. Unless specifically required to be equipped with other type of operators, valves with centerline more than 7 feet 6 inches above the floor shall be provided with chainwheels and operating chains. Operating chains shall be stainless steel and shall be looped to extend within 4 feet of the floor.

2.02 BUTTERFLY VALVES FOR AIR SERVICE

A. Valves shall be wafer type specifically designed for air service. Valves designed for water service are not acceptable. Valves shall be rated at 125 psi and provide airtight shutoff to the full valve rating. Seat shall be mechanically held in place and shall be field-replaceable. Valves shall be wafer design.

B. Valves shall be constructed of the following materials:

Component	Material
Body	Cast iron
Disc	Cast iron
Shaft	Stainless steel, Type 416
Seal	Swing-thru
Packing	Graphited Teflon

C. Operators for valves shall be latch lock levers. Valves shall be capable of being locked in at least 5 intermediate positions between fully open and fully closed.

D. Valves shall be Lamson Model BA-1061 or approved equal.

2.03 CHECK VALVES FOR AIR SERVICE

A. Valve design shall be springless and seatless. Valve shall be designed for horizontal or vertical installation. Flange shall conform to ANSI B16.1 Class 125.

B. Valves shall be constructed of the following materials unless otherwise specified:

Component	Material
Body	Cast iron
Internals	Aluminum
Seal	Silicone

C. Valves shall be Hoffman Lamson Model BA-1006 or approved equal.

PART 3 : EXECUTION

3.01 INSTALLATION

A. Valves shall be installed in accordance with the referenced standards and the manufacturer's recommendations.

3.02 ACCESS

A. Install valves in accessible location to allow for maintenance and removal.

B. Provide chain-guides and chains for valves 4-inch and larger with horizontal centerline of the valve more than 7-feet above the floor. Mount valve horizontally with chain long enough to terminate 4-feet above the floor. Chain operators shall be same manufacturer as the valve.

END OF SECTION 40 05 67

SECTION 40 12 53
PROCESS PIPING AND FITTINGS

PART 1 : GENERAL

1.01 SUMMARY

A. This Section specifies pipe materials and fittings that shall be used in conjunction with the installation of the air scour blowers and air compressor.

1.02 REFERENCES

A. All materials and methods shall conform to the latest, applicable requirements of documents listed hereafter. Unless otherwise specified, references to documents shall mean the documents in effect at the time of the effective date of the Agreement. If reference documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization. In case of conflict between this Section and the listed documents, the requirements of this Section shall prevail.

1.	ASME Section IX	Welding Qualifications
2.	ASTM A240	Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
3.	ASTM A380	Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
4.	ASTM A774	Specification for As-Welded Wrought Austenitic Stainless-Steel Fittings for General Corrosive Service Low and Moderate Temperature
5.	ASTM A778	Welded Unannealed Austenitic Stainless-Steel Tubular Product
6.	ASTM A36	Standard Specification for Carbon Structural Steel
7.	ASTM B32	Standard Specifications for Solder Metal
8.	ASTM B42	Seamless Copper Pipes
9.	ASTM B88	Seamless Copper Water Tube
10.	ASME B16.22	Wrought Copper and Copper Alloy Solider-Joint Pressure Fittings
11.	ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings
12.	ANSI B36.19	Stainless Steel Pipe

1.03 SUBMITTALS

A. In accordance with the requirements of Section 01 33 00 - Submittals, submit the following Project Data:

1. Manufacturer's technical data for piping, and documentation of conformance with appropriate standards and these specifications.
2. Detailed drawings of interior and exterior piping requirements, prepared in conformance with the following:
    a. Drawings shall accurately locate existing structures and piping to remain.
    b. Drawings shall accurately show the location of all existing and new structures and pipe, including the location of valves, air scour blower, and air compressor.
    c. Plan drawings shall be at a scale not less than 1-inch equals 10 feet.
    d. Drawings shall be dimensioned to show relationship between structures and piping and appurtenances. Specific locations of new piping, method of connection, and methods of pipe penetration shall be shown on the drawings.

B. Detailed drawings of interior and exposed piping requirements, prepared in conformance with the following:

1. Plan drawings shall be prepared for areas involving piping and equipment at a scale not less than 3/8-inch equals 1 foot. Upper and lower plan drawings shall be prepared. Sections shall be cut as required to clearly show piping in each of the plan drawings.
2. Drawings shall be dimensioned to verify the locations of existing and new pipe, conduit, valves, supports, and other appurtenances.
3. Drawings shall be dimensioned to show the location of new piping, pipe joints, pipe supports, pipe penetrations, valve end connections, and other piping appurtenances.
4. Drawings shall clearly show the methods of pipe joint connections, pipe support, pipe penetrations, valve end connections, and other piping appurtenances.
5. Piping support structural requirements, calculations, manufacturers, spacing, and detailed drawings as required to establish that the proposed piping support and restraints meet the requirements of the specifications, drawings, and piping manufacturer.
6. Drawings shall show structural and mechanical components of the piping systems separately if required for clarity.

C. Certifications:

1. Certification of conformance with ASTM A380 for handling and cleaning of stainless steel.

1.04 QUALITY ASSURANCE

A. The Contractor shall utilize quality control procedures acceptable to the Engineer for the following:

1. Inspection of pipe before installation.

2. Pipe unloading, storage, installation, and jointing.

B. Tests performed in accordance with Sections 01 91 10 - Facility Startup and Testing shall include, but not be limited to, the following:

1. Air Pressure Test.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Exercise care in transporting and handling to avoid damage to material.

B. Store materials on the site to prevent damage or theft.

C. Keep materials clean, dry, and free from deleterious conditions.

D. Do not store materials directly on the ground.

E. Repair or replace damaged material or equipment to the satisfaction of the Project Manager.

F. Protect electrical equipment, controls, and insulation against moisture and water damage.

G. The Contractor shall be responsible for equipment included in this Contract until it has been inspected, tested, and accepted in accordance with the requirements of these Specifications.

PART 2 : PRODUCTS

2.01 GENERAL

A. Materials required for piping and connections shall be as specified herein. Pipe sizes shall be as shown on the Drawings.

B. Pipe sizes as shown on the drawings and as specified herein are in reference to “nominal” diameter, unless otherwise indicated.

C. The piping systems shown on the Drawings indicate the appropriate horizontal and vertical configuration required. The Contractor shall determine the exact layout of piping, fittings, and joints necessary to fit actual field conditions.

D. Pipe shall be installed with unions, couplings, and flanged coupling adapters as required to allow placement of the pipe and removal of valves and equipment. Each pipe system, including fittings and couplings, shall be provided by a single manufacturer.

2.02 STAINLESS STEEL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Pipe shall be manufactured from ASTM A240 annealed and pickled sheets and plates in accordance with ASTM A778 in Grade TP 316L stainless steel.

2. Pipe shall be manufactured to nominal pipe sizes as listed in ANSI B36.19, Table 2, and shall be Schedule 40.

3. The finish on the raw material, manufactured to ASTM A240 will be No. 1, HRAP (hot rolled annealed and pickled) or better. The finish on the completed pipe and fittings shall be as specified in ASTM A778 and A774, respectively.

B. Spools:

1. Fabricated spools shall be provided with the end treatments called out on the plans. Rolled groove or cut groove pipe ends shall be fabricated to the manufacturer's recommendations. Onsite fabrication of spools will be allowed. Contractor to provide two (2) sample rolled or cut groove pipe end sections from the designated fabricator and equipment intended to fabricate the pipe spools in the field. Once the samples have been approved by the Engineer, the contractors designated fabricator can fabricate spools to be used for the contract.

2. Flange end spools shall be made up of grade TP 314 stainless pipe with weld on slip-over type rolled angle face rings and rated to ANSI B16.1 class 125 standard. The angle face ring thickness shall be equal to or greater than the wall of the pipe or fitting to which it is welded, and it shall be continuously welded on both sides to the pipe or fitting.

C. Fittings/Nipples:

1. Fittings and pre-fabricated nipples shall by Victaulic. Fittings shall be a minimum of schedule 40, grade TP 316 stainless and shop fabricated.

D. Couplings:

1. Rigid couplings shall be Victaulic Style 07, Zero-Flex Rigid Couplings.

2. Flexible couplings shall be Victaulic Style 77, Standard Flexible Couplings.

3. Victaulic-flange adapters shall be Victaulic Style 741, Vic-Flange Adapter for ANSI Class 150.

E. Gaskets:

1. Victaulic Couplings:

   a. Air piping gaskets shall be silicone suitable for air temperature up to 350 degrees F.

   b. Piping gaskets shall be Viton by Dupont, or approved equal.

F. Full Face Flange Gaskets:

1. Air piping gaskets shall be silicone suitable for air temperature up to 350 degrees F.

2. Piping gaskets shall be Viton by Dupont, or approved equal.

G. Hardware:

1. Bolts and nuts shall be 316 stainless steel.

2.03 EXPANSION JOINTS

A. Expansion joints at blower inlets and outlets shall be designed specifically for air service and rated at 150 psi.

B. Expansion joints shall be constructed of the following materials:

Component	Material
Body	EPDM
Retaining Rings	Ductile iron

C. Expansion joints shall be Hoffman Lamson model HF00485050 or approved equal.

2.04 INTAKE FILTER SILENCER

A. Intake filter silencers at blower inlets shall be cartridge type for air service and designed for a minimum flow rate of 3,825 CFM.

B. Intake filter silencers shall be constructed of the following materials:

Component	Material
Connection	ASME 125-pound iron flange
Housing	Carbon Steel
Element Core	Galvanized Steel

C. Intake filter silencer shall be Hoffman Lamson Model VP1012718 or approved equal.

2.05 BLOWER DISCHARGE SILENCER

A. Blower discharge silencers at blower outlets shall be absorption type for air service and designed for minimum flow rate of 3,825 CFM.

B. Blower discharge silencers shall be constructed of the following materials:

Component	Material
Connection	ASME 125-pound iron flange
Body	Heavy-Duty Steel
Acoustical Media	High Density Polyester Fiber

C. Blower discharge silencer shall be Hoffman Lamson Model HF00895743 or approved equal.

2.06 PRESSURE GAUGE

A. Pressure gauges installed on blower discharge piping shall have a dial range of 0-15 psi, a gauge size of 4.5-inches, and a 0.5-inch NPT connection.

B. Pressure gauges shall be Gardner Denver Model 27P333 or approved equal.

2.07 COPPER PIPE AND FITTINGS

A. Pipe and Fittings:

1. Copper pipe shall be rigid Type K and sized as shown on the Drawings.
2. Copper fittings shall be as shown on the Drawings.
3. Copper pipe and fittings shall be connected by soldering. Wrought copper solder joint seamless fittings shall de designed for use with copper pipe and conform to ASTM B 75 and ASME B 16.22. Material shall be UNS C10200, C12000, or C12200. Cast copper solder joint pressure fittings shall be designed for use with copper piping and conform to ASME 16.18.
4. Solder shall be 95-5 (95% tin and 5% antimony) conforming to ASTM B 32, Alloy Grade Sb5 or silver solder conforming to AMS 4773C> Do not use lead or cored solder.
5. Solder flux shall comply with ASTM B 813.

PART 3 : EXECUTION

3.01 GENERAL

A. The Contractor shall be responsible for checking and verification of existing piping and appurtenances whether they are shown on the Drawings. The Contractor shall locate and identify points of connection. The Contractor shall check and verify or modify horizontal and vertical locations of each exposed piping run. The Contractor shall be responsible for the protection of existing piping, appurtenances, and structures during construction and shall take care not to damage them or impair their operation.

B. Where the size of piping is not specified, the Contractor shall provide piping of the sizes required by UPC. Unless specified otherwise, small piping (less than 1 inch in diameter) required for service not described by UPC shall be ½ inch.

C. Piping hangers and structural attachments shall be as shown and shall be as specified in Section 13 53 00 - Seismic Restraint Requirements for Non-Structural Components. Seismic restraints shall be designed in conjunction with pipe to be supported and shall be installed in accordance with the approved submittal design and drawings. The Contractor shall install piping support such that line and grade requirements are satisfied.

D. Bends and tees in pressure piping systems shall be restrained for the test pressure, unless specified otherwise.

E. Line and Grade Deviations:

1. Exposed Pipe. Variance from required line and grade shall not be greater than 1 inch. Pipe shall be laid in straight runs with fittings as required for bends. Gravity flow pipe shall be laid at constant slope.

F. The interior of the pipeline shall be cleaned as the work progresses.

G. Pipe penetrations into structures shall be as shown and detailed on the Drawings.

H. Electrical Isolation:

1. Connections between dissimilar metal pipe, such as copper or bronze to steel, coated to uncoated metallic piping, or piping with different types of coatings, shall be electrically isolated with an electrically insulating fitting. Fittings shall be unions, couplings, or flange sets for the service intended unless specified otherwise. Electrical isolation between valve and stainless steel piping for air service is not required. The Engineer will conduct tests to verify electrical isolation.

3.02 STAINLESS STEEL PIPING

A. After the manufacture of individual stainless-steel fittings and pipe assemblies, they shall be pickled by immersion in a tank containing an ambient nitric hydrofluoric acid solution made up from Oakite Deoxidizer SS, or approved equal.

1. The duration of immersion shall be 15 to 20 minutes and may be supplemented by manually scrubbing or brushing with nonmetallic pads or stainless-steel wire brushes. The acid treatment shall be followed by immersion in a rinse water tank, followed if necessary by a spray rinse. The stainless-steel products shall then be allowed to air dry to achieve passivation.
2. Welding of pipe spools shall be performed using welders and procedures qualified in accordance with ASME Section IX. Piping with wall thicknesses up to and including 11-gauge (0.125”) shall be welded with the TIG (GTAW) process. Heavier walls shall be beveled according to procedure, root pass welded with the TIG (GTAW), and have subsequent weld passes performed using the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process.
3. After shop fabrication into pipe spools, exterior welds shall be manually scrubbed or brushed with non-metallic pads or stainless-steel wire brushes to remove weld discoloration, rinsed with clean water and allowed to air dry.
4. Painting of the stainless-steel pipe is not required. The contractor shall be responsible for supplying and installing the stainless-steel piping with a consistently clean surface.
5. Prior to testing, pipelines shall be cleaned to remove shavings, welding slag, dirt, construction debris, and other foreign material and flushed with clean water at a minimum of 3 fps velocity.
6. Cleaning, flushing, and testing shall be done per this Section.

B. Couplings and Joints:

1. Sleeve-type mechanical pipe couplings shall be provided in strict accordance with these specifications and the manufacturer's instructions. Grooved-end flexible couplings shall be installed in strict accordance with these specifications, AWWA C606, and the manufacturer's instructions.

Grooved-end couplings shall not be employed on buried, encased, or embedded applications unless otherwise indicated on the drawings and elsewhere in the specifications.

2. Where cutting of existing pipe is required for new fitting installation, the Contractor shall replace the entire length of pipe to the nearest joint.

3. Couplings shall be installed on exposed piping at walls, valves, and equipment to allow disassembly of the piping. Unions shall be employed on piping 2 inches and smaller. Flanged or grooved-end couplings joints shall be employed on piping 3 inches and larger. Where piping passes through walls, couplings shall be provided within 2 feet of wall. A coupling shall be provided within 2 feet of each threaded-end valve unless the valve can otherwise be easily removed from the piping.

4. Testing:

    a. Contractor shall perform tests specified. Provide all test equipment including test pumps, gauges, volumetric measuring equipment, and other equipment required. Pressure gauges used shall be graduated in increments not greater than 5 psi and shall have a range of approximately twice test pressure. Use only gauges and instruments recently calibrated. Testing pressure to 30 PSI for 240 minutes.

    b. Where testing is specified, completed installation shall comply with designated requirements. Provide replacement materials as may be required to accomplish this compliance.

    c. Remove from systems, during testing, equipment which will be damaged by test pressure. Replace removed equipment after testing. Systems may be tested in sections as work progresses; however, previously tested portions shall be tested with the overall system tested later. Where new pipe connects to existing piping, the joint between the two pipes shall be tested. Correct leaks by remaking joints with new material; makeshift remedies will not be permitted. Test time will be accrued only while full test pressure is applied to system.

    d. The Contractor shall be responsible for providing temporary fittings, plugs, and thrust blocking for testing at the specified pressure.

    e. Perform testing before backfilling, concealing, insulating, or painting.

    f. Each section of pipeline which fails the pressure test and connection pipe and fittings that are observed to leak shall be removed and either properly reinstalled, or replaced with new materials. Reinstalled and replaced pipeline sections shall be pressure tested.

3.03 COPPER RIGID PIPE

A. General:

1. Install pipe and tube without springing, forcing, or stressing the pipe, tube, or any connecting valves.
2. Provide pipe hangers and supports for pipe and tube where installed above ground, in vaults and structures.
3. Use soldered joints and fittings with copper water tube in buried and exposed service.

B. Installation:

1. Tube cutters shall always be sharp. Do not take too deep a cut with each turn of the cutter or back and forth motion of a saw blade.
2. Cut tubing square and remove burrs. Use a sizing ring on the ends of soft copper tubing, and bring to true dimension and roundness. Clean the surfaces to be soldered with fine emery cloth, cleaning pads, or special wire brushes. Rub hard enough to remove the surface film of oil, grease, heavy oxide, and soil, but not hard enough to remove metal. Coat clean surfaces with a thin film of non-toxic and non-corrosive flux, assemble joint full depth, and remove excess flux before soldering.
3. Make soldered joints in accordance with ASTM B 828. Solder shall penetrate to the full depth of the cup in joints and fittings. Solderers shall comply with ASME B31.3, paragraph 333.

C. Pressure Testing:

1. Test copper pipe to 1 1/2 times the normal operating pressure for 240 minutes.

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APPENDIX A

Prevailing Wage Rates

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APPENDIX A1 - PREVAILING WAGE RATES

State of Washington
Department of Labor & Industries

Prevailing Wage Section - Telephone 360-902-5335
PO Box 44540, Olympia, WA 98504-4540

Washington State Prevailing Wage

The PREVAILING WAGES listed here include both the hourly wage rate and the hourly rate of fringe benefits. On public works projects, worker's wage and benefit rates must add to not less than this total. A brief description of overtime calculation requirements are provided on the Benefit Code Key.

Journey Level Prevailing Wage Rates for the Effective Date: 07/09/2024

County	Trade	Job Classification	Wage	Holiday	Overtime	Note	*Risk Class
Snohomish	Carpenters	Acoustical Worker	$74.96	15J	4C		View
Snohomish	Carpenters	Bridge, Dock And Wharf Carpenters	$74.96	15J	4C		View
Snohomish	Carpenters	Floor Layer & Floor Finisher	$74.96	15J	4C		View
Snohomish	Carpenters	Journey Level	$74.96	15J	4C		View
Snohomish	Carpenters	Scaffold Erector	$74.96	15J	4C		View
Snohomish	Electricians - Inside	Cable Splicer	$90.40	7H	1E		View
Snohomish	Electricians - Inside	Construction Stock Person	$42.59	7H	1D		View
Snohomish	Electricians - Inside	Journey Level	$84.73	7H	1E		View
Snohomish	Electronic Technicians	Electronic Technicians Journey Level	$53.94	5B	1B		View
Snohomish	Insulation Applicators	Journey Level	$74.96	15J	4C		View
Snohomish	Ironworkers	Journeyman	$87.80	15K	11N		View
Snohomish	Laborers	Air, Gas Or Electric Vibrating Screed	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Airtrac Drill Operator	$60.90	15J	11P	8Y	View
Snohomish	Laborers	Ballast Regular Machine	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Batch Weighman	$50.07	15J	11P	8Y	View
Snohomish	Laborers	Brick Pavers	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Brush Cutter	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Brush Hog Feeder	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Burner	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Caisson Worker	$60.90	15J	11P	8Y	View
Snohomish	Laborers	Carpenter Tender	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Cement Dumper-paving	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Cement Finisher Tender	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Change House Or Dry Shack	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Chipping Gun (30 Lbs. And Over)	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Chipping Gun (Under 30 Lbs.)	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Choker Setter	$59.07	15J	11P	8Y	View

Snohomish	Laborers	Chuck Tender	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Clary Power Spreader	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Clean-up Laborer	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Concrete Dumper/Chute Operator	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Concrete Form Stripper	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Concrete Placement Crew	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Concrete Saw Operator/Core Driller	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Crusher Feeder	$50.07	15J	11P	8Y	View
Snohomish	Laborers	Curing Laborer	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Demolition: Wrecking & Moving (Incl. Charred Material)	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Ditch Digger	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Diver	$60.90	15J	11P	8Y	View
Snohomish	Laborers	Drill Operator (Hydraulic, Diamond)	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Dry Stack Walls	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Dump Person	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Epoxy Technician	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Erosion Control Worker	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Faller & Bucker Chain Saw	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Fine Graders	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Firewatch	$50.07	15J	11P	8Y	View
Snohomish	Laborers	Form Setter	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Gabian Basket Builders	$59.07	15J	11P	8Y	View
Snohomish	Laborers	General Laborer	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Grade Checker & Transit Person	$62.49	15J	11P	8Y	View
Snohomish	Laborers	Grinders	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Grout Machine Tender	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Groutmen (Pressure) Including Post Tension Beams	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Guardrail Erector	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Hazardous Waste Worker (Level A)	$60.90	15J	11P	8Y	View
Snohomish	Laborers	Hazardous Waste Worker (Level B)	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Hazardous Waste Worker (Level C)	$59.07	15J	11P	8Y	View
Snohomish	Laborers	High Scaler	$60.90	15J	11P	8Y	View
Snohomish	Laborers	Jackhammer	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Laserbeam Operator	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Maintenance Person	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Manhole Builder-Mudman	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Material Yard Person	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Mold Abatement Worker	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Motorman-Dinky Locomotive	$62.59	15J	11P	8Y	View

Snohomish	Laborers	nozzleman (concrete pump, green cutter when using combination of high pressure air & water on concrete & rock, sandblast, gunite, shotcrete, water blaster, vacuum blaster)	$62.49	15J	11P	8Y	View
Snohomish	Laborers	Pavement Breaker	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Pilot Car	$50.07	15J	11P	8Y	View
Snohomish	Laborers	Pipe Layer (Lead)	$62.49	15J	11P	8Y	View
Snohomish	Laborers	Pipe Layer/Tailor	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Pipe Pot Tender	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Pipe Reliner	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Pipe Wrapper	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Pot Tender	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Powderman	$60.90	15J	11P	8Y	View
Snohomish	Laborers	Powderman's Helper	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Power Jacks	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Railroad Spike Puller - Power	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Raker - Asphalt	$62.49	15J	11P	8Y	View
Snohomish	Laborers	Re-timberman	$60.90	15J	11P	8Y	View
Snohomish	Laborers	Remote Equipment Operator	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Rigger/Signal Person	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Rip Rap Person	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Rivet Buster	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Rodder	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Scaffold Erector	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Scale Person	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Sloper (Over 20")	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Sloper Sprayer	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Spreader (Concrete)	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Stake Hopper	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Stock Piler	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Swinging Stage/Boatswain Chair	$50.07	15J	11P	8Y	View
Snohomish	Laborers	Tamper & Similar Electric, Air & Gas Operated Tools	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Tamper (Multiple & Self-propelled)	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Timber Person - Sewer (Lagger, Shorer & Cribber)	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Toolroom Person (at Jobsite)	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Topper	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Track Laborer	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Track Liner (Power)	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Traffic Control Laborer	$53.54	15J	11P	9C	View
Snohomish	Laborers	Traffic Control Supervisor	$56.73	15J	11P	9C	View
Snohomish	Laborers	Truck Spotter	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Tugger Operator	$60.15	15J	11P	8Y	View

Snohomish	Laborers	Tunnel Work-Compressed Air Worker 0-30 psi	$175.79	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Compressed Air Worker 30.01-44.00 psi	$180.82	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Compressed Air Worker 44.01-54.00 psi	$184.50	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Compressed Air Worker 54.01-60.00 psi	$190.20	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Compressed Air Worker 60.01-64.00 psi	$192.32	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Compressed Air Worker 64.01-68.00 psi	$197.42	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Compressed Air Worker 68.01-70.00 psi	$199.32	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Compressed Air Worker 70.01-72.00 psi	$201.32	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Compressed Air Worker 72.01-74.00 psi	$203.32	15J	11P	9B	View
Snohomish	Laborers	Tunnel Work-Guage and Lock Tender	$62.59	15J	11P	8Y	View
Snohomish	Laborers	Tunnel Work-Miner	$62.59	15J	11P	8Y	View
Snohomish	Laborers	Vibrator	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Vinyl Seamer	$59.07	15J	11P	8Y	View
Snohomish	Laborers	Watchman	$45.51	15J	11P	8Y	View
Snohomish	Laborers	Welder	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Well Point Laborer	$60.15	15J	11P	8Y	View
Snohomish	Laborers	Window Washer/Cleaner	$45.51	15J	11P	8Y	View
Snohomish	Laborers - Underground Sewer & Water	General Laborer & Topman	$59.07	15J	11P	8Y	View
Snohomish	Laborers - Underground Sewer & Water	Pipe Layer	$60.15	15J	11P	8Y	View
Snohomish	Modular Buildings	Journey Level	$16.28		1		View
Snohomish	Painters	Journey Level	$51.71	6Z	11J		View
Snohomish	Plumbers & Pipefitters	Journey Level	$86.72	5A	1G		View
Snohomish	Power Equipment Operators	Asphalt Plant Operators	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Assistant Engineer	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Barrier Machine (zipper)	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Batch Plant Operator: concrete	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Boat Operator	$83.95	7A	11H	8X	View
Snohomish	Power Equipment Operators	Bobcat	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Brokk - Remote Demolition Equipment	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Brooms	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Bump Cutter	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Cableways	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Chipper	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Compressor	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Concrete Finish Machine - Laser Screed	$78.65	15J	11G	8X	View

Snohomish	Power Equipment Operators	Concrete Pump - Mounted Or Trailer High Pressure Line Pump, Pump High Pressure	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Concrete Pump: Truck Mount With Boom Attachment Over 42 M	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Concrete Pump: Truck Mount With Boom Attachment Up To 42m	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Conveyors	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Cranes Friction: 200 tons and over	$86.48	7A	11H	8X	View
Snohomish	Power Equipment Operators	Cranes, A-frame: 10 tons and under	$78.95	7A	11H	8X	View
Snohomish	Power Equipment Operators	Cranes: 100 tons through 199 tons, or 150' of boom (including jib with attachments)	$84.77	7A	11H	8X	View
Snohomish	Power Equipment Operators	Cranes: 20 tons through 44 tons with attachments	$83.20	7A	11H	8X	View
Snohomish	Power Equipment Operators	Cranes: 200 tons- 299 tons, or 250' of boom including jib with attachments	$85.66	7A	11H	8X	View
Snohomish	Power Equipment Operators	Cranes: 300 tons and over or 300' of boom including jib with attachments	$86.48	7A	11H	8X	View
Snohomish	Power Equipment Operators	Cranes: 45 tons through 99 tons, under 150' of boom(including jib with attachments)	$83.95	7A	11H	8X	View
Snohomish	Power Equipment Operators	Cranes: Friction cranes through 199 tons	$85.66	7A	11H	8X	View
Snohomish	Power Equipment Operators	Cranes: through 19 tons with attachments, a-frame over 10 tons	$82.56	7A	11H	8X	View
Snohomish	Power Equipment Operators	Crusher	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Deck Engineer/Deck Winches (power)	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Derricks, On Building Work	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Dozers D-9 & Under	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Drill Oilers: Auger Type, Truck Or Crane Mount	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Drilling Machine	$84.46	15J	11G	8X	View
Snohomish	Power Equipment Operators	Elevator and man-lift: permanent and shaft type	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Finishing Machine, Bidwell And Gamaco & Similar Equipment	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Forklift: 3000 lbs and over with attachments	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Forklifts: under 3000 lbs. with attachments	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Grade Engineer: Using Blue Prints, Cut Sheets, Etc	$82.88	15J	11G	8X	View

Snohomish	Power Equipment Operators	Gradechecker/Stakeman	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Guardrail Punch	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Hard Tail End Dump Articulating Off- Road Equipment 45 Yards. & Over	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Hard Tail End Dump Articulating Off-road Equipment Under 45 Yards	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Horizontal/Directional Drill Locator	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Horizontal/Directional Drill Operator	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Hydralifts/Boom Trucks Over 10 Tons	$82.56	7A	11H	8X	View
Snohomish	Power Equipment Operators	Hydralifts/boom trucks: 10 tons and under	$78.95	7A	11H	8X	View
Snohomish	Power Equipment Operators	Leverman	$85.33	15J	11G	8X	View
Snohomish	Power Equipment Operators	Loader, Overhead, 6 Yards. But Not Including 8 Yards	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Loaders, Overhead Under 6 Yards	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Loaders, Plant Feed	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Loaders: Elevating Type Belt	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Locomotives, All	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Material Transfer Device	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Mechanics: All (Leadmen - $0.50 per hour over mechanic)	$84.46	15J	11G	8X	View
Snohomish	Power Equipment Operators	Motor Patrol Graders	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Mucking Machine, Mole, Tunnel Drill, Boring, Road Header And/or Shield	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Oil Distributors, Blower Distribution & Mulch Seeding Operator	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Outside Hoists (Elevators and Manlifts), Air Tuggers, Strato	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Overhead, bridge type Crane: 20 tons through 44 tons	$83.20	7A	11H	8X	View
Snohomish	Power Equipment Operators	Overhead, bridge type: 100 tons and over	$84.77	7A	11H	8X	View
Snohomish	Power Equipment Operators	Overhead, bridge type: 45 tons through 99 tons	$83.95	7A	11H	8X	View
Snohomish	Power Equipment Operators	Pavement Breaker	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Pile Driver (other Than Crane Mount)	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Plant Oiler - Asphalt, Crusher	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Posthole Digger, Mechanical	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Power Plant	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Pumps - Water	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Quad 9, Hd 41, D10 And Over	$83.62	15J	11G	8X	View

Snohomish	Power Equipment Operators	Quick Tower: no cab, under 100 feet in height base to boom	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Remote Control Operator On Rubber Tired Earth Moving Equipment	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Rigger and Bellman	$78.95	7A	11H	8X	View
Snohomish	Power Equipment Operators	Rigger/Signal Person, Bellman(Certified)	$82.56	7A	11H	8X	View
Snohomish	Power Equipment Operators	Rollagon	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Roller, Other Than Plant Mix	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Roller, Plant Mix Or Multi-lift Materials	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Roto-mill, Roto-grinder	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Saws - Concrete	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Scraper, Self Propelled Under 45 Yards	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Scrapers - Concrete & Carry All	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Scrapers, Self-propelled: 45 Yards And Over	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Service Engineers: Equipment	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Shotcrete/Gunite Equipment	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Shovel, Excavator, Backhoe, Tractors Under 15 Metric Tons	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Shovel, Excavator, Backhoe: Over 30 Metric Tons To 50 Metric Tons	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Shovel, Excavator, Backhoes, Tractors: 15 To 30 Metric Tons	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Shovel, Excavator, Backhoes: Over 50 Metric Tons To 90 Metric Tons	$84.46	15J	11G	8X	View
Snohomish	Power Equipment Operators	Shovel, Excavator, Backhoes: Over 90 Metric Tons	$85.33	15J	11G	8X	View
Snohomish	Power Equipment Operators	Slipform Pavers	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Spreader, Topsider & Screedman	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Subgrader Trimmer	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Tower Bucket Elevators	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Tower Crane: over 175' through 250' in height, base to boom	$85.66	7A	11H	8X	View
Snohomish	Power Equipment Operators	Tower crane: up to 175' in height base to boom	$84.77	7A	11H	8X	View
Snohomish	Power Equipment Operators	Tower Cranes: over 250' in height from base to boom	$86.48	7A	11H	8X	View
Snohomish	Power Equipment Operators	Transporters, All Track Or Truck Type	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Trenching Machines	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators	Truck Crane Oiler/Driver: 100 tons and over	$83.20	7A	11H	8X	View
Snohomish	Power Equipment Operators	Truck crane oiler/driver: under	$82.56	7A	11H	8X	View

		100 tons					
Snohomish	Power Equipment Operators	Truck Mount Portable Conveyor	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Vac Truck (Vactor Guzzler, Hydro Excavator)	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators	Welder	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators	Wheel Tractors, Farmall Type	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators	Yo Yo Pay Dozer	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Asphalt Plant Operators	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Assistant Engineer	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Barrier Machine (zipper)	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Batch Plant Operator, Concrete	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Boat Operator	$83.95	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Bobcat	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Brokk - Remote Demolition Equipment	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Brooms	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Bump Cutter	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cableways	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Chipper	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Compressor	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Concrete Finish Machine - Laser Screed	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Concrete Pump - Mounted Or Trailer High Pressure Line Pump, Pump High Pressure	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Concrete Pump: Truck Mount With Boom Attachment Over 42 M	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Concrete Pump: Truck Mount With Boom Attachment Up To 42m	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Conveyors	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes Friction: 200 tons and over	$86.48	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes, A-frame: 10 tons and under	$78.95	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes: 100 tons through 199 tons, or 150' of boom (including jib with attachments)	$84.77	7A	11H	8X	View

Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes: 20 tons through 44 tons with attachments	$83.20	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes: 200 tons- 299 tons, or 250' of boom including jib with attachments	$85.66	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes: 300 tons and over or 300' of boom including jib with attachments	$86.48	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes: 45 tons through 99 tons, under 150' of boom(including jib with attachments)	$83.95	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes: Friction cranes through 199 tons	$85.66	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Cranes: through 19 tons with attachments, a-frame over 10 tons	$82.56	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Crusher	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Deck Engineer/Deck Winches (power)	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Derricks, On Building Work	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Dozers D-9 & Under	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Drill Oilers: Auger Type, Truck Or Crane Mount	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Drilling Machine	$84.46	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Elevator and man-lift: permanent and shaft type	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Finishing Machine, Bidwell And Gamaco & Similar Equipment	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Forklift: 3000 lbs and over with attachments	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Forklifts: under 3000 lbs. with attachments	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Grade Engineer: Using Blue Prints, Cut Sheets, Etc	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Gradechecker/Stakeman	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Guardrail Punch	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Hard Tail End Dump Articulating Off- Road Equipment 45 Yards. & Over	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Hard Tail End Dump Articulating Off-road Equipment Under 45 Yards	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Horizontal/Directional Drill Locator	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Horizontal/Directional Drill Operator	$82.88	15J	11G	8X	View

Snohomish	Power Equipment Operators-Underground Sewer & Water	Hydralifts/boom trucks: 10 tons and under	$78.95	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Hydralifts/boom trucks: over 10 tons	$82.56	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Leverman	$85.33	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Loader, Overhead, 6 Yards. But Not Including 8 Yards	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Loaders, Overhead Under 6 Yards	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Loaders, Plant Feed	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Loaders: Elevating Type Belt	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Locomotives, All	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Material Transfer Device	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Mechanics: All (Leadmen - $0.50 per hour over mechanic)	$84.46	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Motor Patrol Graders	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Mucking Machine, Mole, Tunnel Drill, Boring, Road Header And/or Shield	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Oil Distributors, Blower Distribution & Mulch Seeding Operator	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Outside Hoists (Elevators and Manlifts), Air Tuggers, Strato	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Overhead, bridge type Crane: 20 tons through 44 tons	$83.20	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Overhead, bridge type: 100 tons and over	$84.77	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Overhead, bridge type: 45 tons through 99 tons	$83.95	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Pavement Breaker	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Pile Driver (other Than Crane Mount)	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Plant Oiler - Asphalt, Crusher	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Posthole Digger, Mechanical	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Power Plant	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Pumps - Water	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Quad 9, Hd 41, D10 And Over	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Quick Tower: no cab, under 100 feet in height base to boom	$82.88	15J	11G	8X	View

Snohomish	Power Equipment Operators-Underground Sewer & Water	Remote Control Operator On Rubber Tired Earth Moving Equipment	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Rigger and Bellman	$78.95	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Rigger/Signal Person, Bellman(Certified)	$82.56	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Rollagon	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Roller, Other Than Plant Mix	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Roller, Plant Mix Or Multi-lift Materials	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Roto-mill, Roto-grinder	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Saws - Concrete	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Scraper, Self Propelled Under 45 Yards	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Scrapers - Concrete & Carry All	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Scrapers, Self-propelled: 45 Yards And Over	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Shotcrete/Gunite Equipment	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoe, Tractors Under 15 Metric Tons	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoe: Over 30 Metric Tons To 50 Metric Tons	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes, Tractors: 15 To 30 Metric Tons	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes: Over 50 Metric Tons To 90 Metric Tons	$84.46	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Shovel, Excavator, Backhoes: Over 90 Metric Tons	$85.33	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Slipform Pavers	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Spreader, Topsider & Screedman	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Subgrader Trimmer	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Tower Bucket Elevators	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Tower Crane: over 175' through 250' in height, base to boom	$85.66	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Tower crane: up to 175' in height base to boom	$84.77	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Tower Cranes: over 250' in height from base to boom	$86.48	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Transporters, All Track Or Truck Type	$83.62	15J	11G	8X	View

Snohomish	Power Equipment Operators-Underground Sewer & Water	Trenching Machines	$82.25	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Truck Crane Oiler/Driver: 100 tons and over	$83.20	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Truck crane oiler/driver: under 100 tons	$82.56	7A	11H	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Truck Mount Portable Conveyor	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Vac Truck (Vactor Guzzler, Hydro Excavator)	$82.88	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Welder	$83.62	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Wheel Tractors, Farmall Type	$78.65	15J	11G	8X	View
Snohomish	Power Equipment Operators-Underground Sewer & Water	Yo Yo Pay Dozer	$82.88	15J	11G	8X	View
Snohomish	Roofers	Journey Level	$64.45	5A	3H		View
Snohomish	Roofers	Using Irritable Bituminous Materials	$67.39	5A	3H		View
Snohomish	Sheet Metal Workers	Journey Level (Field or Shop)	$96.42	7F	1E		View
Snohomish	Sign Makers & Installers (Electrical)	Sign Installer	$26.56		1		View
Snohomish	Sign Makers & Installers (Electrical)	Sign Maker	$20.50		1		View
Snohomish	Surveyors	Assistant Construction Site Surveyor	$82.56	7A	11H	8X	View
Snohomish	Surveyors	Chainman	$78.95	7A	11H	8X	View
Snohomish	Surveyors	Construction Site Surveyor	$83.95	7A	11H	8X	View
Snohomish	Surveyors	Drone Operator (when used in conjunction with survey work only)	$78.95	7A	11H	8X	View
Snohomish	Surveyors	Ground Penetrating Radar Operator	$78.95	7A	11H	8X	View
Snohomish	Telecommunication Technicians	Telecom Technician Journey Level	$53.94	5B	1B		View
Snohomish	Telephone Line Construction - Outside	Cable Splicer	$40.36	5A	2B		View
Snohomish	Telephone Line Construction - Outside	Hole Digger/Ground Person	$26.92	5A	2B		View
Snohomish	Telephone Line Construction - Outside	Telephone Equipment Operator (Light)	$33.74	5A	2B		View
Snohomish	Telephone Line Construction - Outside	Telephone Lineperson	$38.15	5A	2B		View
Snohomish	Truck Drivers	Asphalt Mix Over 16 Yards	$74.95	15J	11M	8L	View
Snohomish	Truck Drivers	Asphalt Mix To 16 Yards	$74.02	15J	11M	8L	View
Snohomish	Truck Drivers	Dump Truck	$74.02	15J	11M	8L	View
Snohomish	Truck Drivers	Dump Truck & Trailer	$74.95	15J	11M	8L	View
Snohomish	Truck Drivers	Other Trucks	$74.95	15J	11M	8L	View
Snohomish	Truck Drivers - Ready Mix	Transit Mix	$74.95	15J	11M	8L	View

APPENDIX A2 - BENEFIT CODE KEY

Benefit Code Key – Effective 3/2/2024 thru 8/30/2024

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Overtime Codes

Overtime calculations are based on the hourly rate actually paid to the worker. On public works projects, the hourly rate must be not less than the prevailing rate of wage minus the hourly rate of the cost of fringe benefits actually provided for the worker.

1. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

B. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

C. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

D. The first two (2) hours before or after a five-eight (8) hour workweek day or a four-ten (10) hour workweek day and the first eight (8) hours worked the next day after either workweek shall be paid at one and one-half times the hourly rate of wage. All additional hours worked and all worked on Sundays and holidays shall be paid at double the hourly rate of wage.

E. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

F. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours worked, except Labor Day, shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.

G. The first ten (10) hours worked on Saturdays and the first ten (10) hours worked on a fifth calendar weekday in a four-ten hour schedule, shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of ten (10) hours per day Monday through Saturday and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

H. All hours worked on Saturdays (except makeup days if work is lost due to inclement weather conditions or equipment breakdown) shall be paid at one and one-half times the hourly rate of wage. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

I. All hours worked on Sundays and holidays shall also be paid at double the hourly rate of wage.

J. The first two (2) hours after eight (8) regular hours Monday through Friday and the first ten (10) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked over ten (10) hours Monday through Saturday, Sundays and holidays shall be paid at double the hourly rate of wage.

K. All hours worked on Saturdays and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

M. All hours worked on Saturdays (except makeup days if work is lost due to inclement weather conditions) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

1. N. All hours worked on Saturdays (except makeup days) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

O. The first ten (10) hours worked on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays, holidays and after twelve (12) hours, Monday through Friday and after ten (10) hours on Saturday shall be paid at double the hourly rate of wage.

P. All hours worked on Saturdays (except makeup days if circumstances warrant) and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

Q. The first two (2) hours after eight (8) regular hours Monday through Friday and up to ten (10) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of ten (10) hours per day Monday through Saturday and all hours worked on Sundays and holidays (except Christmas day) shall be paid at double the hourly rate of wage. All hours worked on Christmas day shall be paid at two and one-half times the hourly rate of wage.

R. All hours worked on Sundays and holidays shall be paid at two times the hourly rate of wage.

U. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays (except Labor Day) shall be paid at two times the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage.

V. All hours worked on Sundays and holidays (except Thanksgiving Day and Christmas day) shall be paid at one and one-half times the hourly rate of wage. All hours worked on Thanksgiving Day and Christmas day shall be paid at double the hourly rate of wage.

W. All hours worked on Saturdays and Sundays (except make-up days due to conditions beyond the control of the employer)) shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at double the hourly rate of wage.

X. The first four (4) hours after eight (8) regular hours Monday through Friday and the first twelve (12) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked over twelve (12) hours Monday through Saturday, Sundays and holidays shall be paid at double the hourly rate of wage. When holiday falls on Saturday or Sunday, the day before Saturday, Friday, and the day after Sunday, Monday, shall be considered the holiday and all work performed shall be paid at double the hourly rate of wage.

Y. All hours worked outside the hours of 5:00 am and 5:00 pm (or such other hours as may be agreed upon by any employer and the employee) and all hours worked in excess of eight (8) hours per day (10 hours per day for a 4 x 10 workweek) and on Saturdays and holidays (except labor day) shall be paid at one and one-half times the hourly rate of wage. (except for employees who are absent from work without prior approval on a scheduled workday during the workweek shall be paid at the straight-time rate until they have worked 8 hours in a day (10 in a 4 x 10 workweek) or 40 hours during that workweek.) All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and Labor Day shall be paid at double the hourly rate of wage.

Z. All hours worked on Saturdays and Sundays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid the straight time rate of pay in addition to holiday pay.

Overtime Codes Continued

2. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

   B. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage.

   F. The first eight (8) hours worked on holidays shall be paid at the straight hourly rate of wage in addition to the holiday pay. All hours worked in excess of eight (8) hours on holidays shall be paid at double the hourly rate of wage.

   M. This code appears to be missing. All hours worked on Saturdays, Sundays and holidays shall be paid at double the hourly rate of wage.

   R. All hours worked on Sundays and holidays and all hours worked over sixty (60) in one week shall be paid at double the hourly rate of wage.

   U. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked over 12 hours in a day or on Sundays and holidays shall be paid at double the hourly rate of wage.

3. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

   F. All hours worked on Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sunday shall be paid at two times the hourly rate of wage. All hours worked on paid holidays shall be paid at two and one-half times the hourly rate of wage including holiday pay.

   H. All work performed on Sundays between March 16th and October 14th and all Holidays shall be compensated for at two (2) times the regular rate of pay. Work performed on Sundays between October 15th and March 15th shall be compensated at one and one half (1-1/2) times the regular rate of pay.

   J. All hours worked between the hours of 10:00 pm and 5:00 am, Monday through Friday, and all hours worked on Saturdays shall be paid at a one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

   K. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage. All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.

   After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more. When an employee returns to work without at least eight (8) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the eight (8) hours rest period.

Overtime Codes Continued

4. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

A. All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at double the hourly rate of wage. All hours worked on Saturdays, Sundays and holidays shall be paid at double the hourly rate of wage

C. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay. On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay, except that if the job is down on Monday through Friday due to weather conditions or other conditions outside the control of the employer, the first ten (10) hours on Saturday may be worked at the straight time rate of pay. All hours worked over twelve (12) hours in a day and all hours worked on Sunday and Holidays shall be paid at two (2) times the straight time rate of pay.

D. All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at double the hourly rate of wage. All hours worked on Saturday, Sundays and holidays shall be paid at double the hourly rate of pay. Rates include all members of the assigned crew.

EXCEPTION:
On all multipole structures and steel transmission lines, switching stations, regulating, capacitor stations, generating plants, industrial plants, associated installations and substations, except those substations whose primary function is to feed a distribution system, will be paid overtime under the following rates:

The first two (2) hours after eight (8) regular hours Monday through Friday of overtime on a regular workday, shall be paid at one and one-half times the hourly rate of wage. All hours in excess of ten (10) hours will be at two (2) times the hourly rate of wage. The first eight (8) hours worked on Saturday will be paid at one and one-half (1-1/2) times the hourly rate of wage. All hours worked in excess of eight (8) hours on Saturday, and all hours worked on Sundays and holidays will be at the double the hourly rate of wage.

All overtime eligible hours performed on the above described work that is energized, shall be paid at the double the hourly rate of wage.

E. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

On a four-day, ten-hour weekly schedule, either Monday thru Thursday or Tuesday thru Friday schedule, all hours worked after ten shall be paid at double the hourly rate of wage. The Monday or Friday not utilized in the normal four-day, ten hour work week, and Saturday shall be paid at one and one half (1½) times the regular shift rate for the first eight (8) hours. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

G. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

I. The First eight (8) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of eight (8) per day on Saturdays shall be paid at double the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

4. J. The first eight (8) hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked in excess of eight (8) hours on a Saturday shall be paid at double the hourly rate of wage. All hours worked over twelve (12) in a day, and all hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.

K. All hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage, so long as Saturday is the sixth consecutive day worked. All hours worked over twelve (12) in a day Monday through Saturday, and all hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.

L. The first twelve (12) hours worked on a Saturday shall be paid at one and one-half times the hourly rate of wage. All hours worked on a Saturday in excess of twelve (12) hours shall be paid at double the hourly rate of pay. All hours worked over twelve (12) in a day Monday through Friday, and all hours worked on Sundays shall be paid at double the hourly rate of wage. All hours worked on a holiday shall be paid at one and one-half times the hourly rate of wage, except that all hours worked on Labor Day shall be paid at double the hourly rate of pay.

S. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, work performed in excess of (10) hours shall be paid at one and one half (1-1/2) times the hourly rate of pay. On Monday through Friday, work performed outside the normal work hours of 6:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations).

All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All work performed on Sundays and holidays shall be paid at double the hourly rate of wage. When an employee returns to work without at least eight (8) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

Multiple Shift Operations: When the first shift of a multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. Special Shifts: The Special Shift Premium is the basic hourly rate of pay plus $2.00 an hour. When due to conditions beyond the control of the employer or when an owner (not acting as the contractor), a government agency or the contract specifications require more than four (4) hours of a special shift can only be performed outside the normal 6am to 6pm shift then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they shall be paid the special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday).

U. The first four (4) hours after eight (8) regular hours Monday through Friday and the first twelve (12) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. (Except on makeup days if work is lost due to inclement weather, then the first eight (8) hours on Saturday may be paid the regular rate.) All hours worked over twelve (12) hours Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

Overtime Codes Continued

4. V. Work performed in excess of ten (10) hours of straight time per day when four ten (10) hour shifts are established or outside the normal shift (5 am to 6pm), and all work on Saturdays, except for make-up days shall be paid at time and one-half (1 ½) the straight time rate.

In the event the job is down due to weather conditions, then Saturday may, be worked as a voluntary make-up day at the straight time rate. However, Saturday shall not be utilized as a make-up day when a holiday falls on Friday. All work performed on Sundays and holidays and work in excess of twelve (12) hours per day shall be paid at double (2x) the straight time rate of pay.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

When an employee returns to work without a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

X. All hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays and holidays shall be paid at double the hourly rate of wage. Work performed outside the normal shift of 6 am to 6pm shall be paid at one and one-half the straight time rate, (except for special shifts or three shift operations). All work performed on Sundays and holidays shall be paid at double the hourly rate of wage. Shifts may be established when considered necessary by the Employer.

The Employer may establish shifts consisting of eight (8) or ten (10) hours of work (subject to WAC 296-127-022), that shall constitute a normal forty (40) hour work week. The Employer can change from a 5-eight to a 4-ten hour schedule or back to the other. All hours of work on these shifts shall be paid for at the straight time hourly rate. Work performed in excess of eight hours (or ten hours per day (subject to WAC 296-127-022) shall be paid at one and one-half the straight time rate.

When due to conditions beyond the control of the Employer, or when contract specifications require that work can only be performed outside the regular day shift, then by mutual agreement a special shift may be worked at the straight time rate, eight (8) hours work for eight (8) hours pay. The starting time shall be arranged to fit such conditions of work.

When an employee returns to work without at a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

11. ALL HOURS WORKED IN EXCESS OF EIGHT (8) HOURS PER DAY OR FORTY (40) HOURS PER WEEK SHALL BE PAID AT ONE AND ONE-HALF TIMES THE HOURLY RATE OF WAGE.

B After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

C The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other overtime hours worked, except Labor Day, and all hours on Sunday shall be paid at double the hourly rate of wage. All hours worked on Labor Day shall be paid at three times the hourly rate of wage. All non-overtime and non-holiday hours worked between 4:00 pm and 5:00 am, Monday through Friday, shall be paid at a premium rate of 15% over the hourly rate of wage.

Overtime Codes Continued

11. D. All hours worked on Saturdays and holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked on Sundays shall be paid at double the hourly rate of wage.

After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

E. The first two (2) hours after eight (8) regular hours Monday through Friday, the first ten (10) hours on Saturday, and the first ten (10) hours worked on Holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked over ten (10) hours Monday through Saturday, and Sundays shall be paid at double the hourly rate of wage.

After an employee has worked eight (8) hours, all additional hours worked shall be paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours or more.

F. The first two (2) hours after eight (8) regular hours Monday through Friday and the first eight (8) hours on Saturday shall be paid at one and one-half times the hourly rate of wage. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

On a four-day, ten-hour weekly schedule, either Monday thru Thursday or Tuesday thru Friday schedule, all hours worked after ten shall be paid at double the hourly rate of wage. The Monday or Friday not utilized in the normal four-day, ten hour work week, and Saturday shall be paid at one-half times the hourly rate of wage for the first eight (8) hours. All other hours worked Monday through Saturday, and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

G. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage.

All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of nine (9) hours or more. When an employee returns to work without at least nine (9) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the nine (9) hours rest period.

H. Work performed in excess of eight (8) hours of straight time per day, or ten (10) hours of straight time per day when four ten (10) hour shifts are established, or forty (40) hours of straight time per week, Monday through Friday, or outside the normal 5 am to 6pm shift, and all work on Saturdays shall be paid at one and one-half times the hourly rate of wage.

All work performed after 6:00 pm Saturday to 5:00 am Monday and Holidays, and all hours worked in excess of twelve (12) hours in a single shift shall be paid at double the hourly rate of wage.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of ten (10) hours or more. When an employee returns to work without at least ten (10) hours time off since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until he/she shall have the ten (10) hours rest period.

Overtime Codes Continued

11. J. All hours worked on holidays shall be paid at double the hourly rate of wage.

K. On Monday through Friday hours worked outside 4:00 am and 5:00 pm, and the first two (2) hours after eight (8) hours worked shall be paid at one and one-half times the hourly rate. All hours worked over 10 hours per day Monday through Friday, and all hours worked on Saturdays, Sundays, and Holidays worked shall be paid at double the hourly rate of wage.

L. An employee working outside 5:00 am and 5:00 pm shall receive an additional two dollar ($2.00) per hour for all hours worked that shift. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage. All hours worked on holidays shall be paid at one and one-half times the hourly rate of wage.

M. On Monday through Friday, the first four (4) hours of overtime after eight (8) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay, unless a four (4) day ten (10) hour workweek has been established. On a four (4) day ten (10) hour workweek scheduled Monday through Thursday, or Tuesday through Friday, the first two (2) hours of overtime after ten (10) hours of straight time work shall be paid at one and one half (1-1/2) times the straight time rate of pay.

Work performed outside the normal work hours of 5:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations). When the first shift of a multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. When due to conditions beyond the control of the Employer or when contract specifications require that work can only be performed outside the regular day shift of 5:00 am to 6:00 pm, then a special shift may be worked at the straight time rate, plus the shift pay premium when applicable. The starting time of work will be arranged to fit such conditions of work. Such shift shall consist of eight (8) hours work for eight (8) hours pay or ten (10) hours work for ten (10) hours pay for four ten shifts.

On Saturday, the first twelve (12) hours of work shall be paid at one and one half (1-1/2) times the straight time rate of pay. All work performed after 6:00 pm Saturday to 5:00 am Monday, all work performed over twelve (12) hours, and all work performed on holidays shall be paid at double the straight time rate of pay.

Shift Pay Premium: In an addition to any overtime already required, all hours worked between the hours of 6:00 pm and 5:00 am shall receive an additional two dollars ($2.00) per hour.

N. All work performed over twelve hours in a shift and all work performed on Sundays and Holidays shall be paid at double the straight time rate.

Any time worked over eight (8) hours on Saturday shall be paid double the straight time rate, except employees assigned to work six 10-hour shifts per week shall be paid double the straight time rate for any time worked on Saturday over 10 hours.

O. All work performed on Saturdays, Sundays, and Holidays shall be paid at one and one half (1-1/2) times the straight time rate of pay.

Overtime Codes Continued

11. P. Work performed in excess of ten (10) hours of straight time per day when four ten (10) hour shifts are established and all work on Saturdays, except for make-up days shall be paid at time and one-half (1 ½) the straight time rate.

Work performed outside the normal work hours of 5:00 a.m. and 6:00 p.m. shall be paid at one and one-half (1-1/2) times the straight time rate, (except for special shifts or multiple shift operations). When the first shift of multiple shift (a two or three shift) operation is started at the basic straight time rate or at a specific overtime rate, all shifts of that day's operation shall be completed at that rate. When due to conditions beyond the control of the Employer or when contract specifications require that work can only be performed outside the regular day shift of 5:00 a.m. to 6:00 p.m., then a special shift may be worked at the straight time rate, plus the shift pay premium when applicable. The starting time of work will be arranged to fit such conditions of work. Such shifts shall consist of eight (8) hours work for eight (8) hours pay or ten (10) hours work for ten (10) hours pay for four ten-hour shifts.

In the event the job is down due to weather conditions, then Saturday may, be worked as a voluntary make-up day at the straight time rate. However, Saturday shall not be utilized as a make-up day when a holiday falls on Friday. All work performed on Sundays and holidays and work in excess of twelve (12) hours per day shall be paid at double (2x) the straight time rate of pay.

After an employee has worked eight (8) hours at an applicable overtime rate, all additional hours shall be at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

When an employee returns to work without a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

Q. All hours worked between the hours of 6:00 pm and 6:00 am, Monday through Saturday, shall be paid at a premium rate of 35% over the hourly rate of wage. Work performed on Sundays shall be paid at double time. All hours worked on holidays shall be paid at double the hourly rate of wage.

R On Monday through Saturday hours worked outside 6:00 am and 7:00 pm, and all hours after eight (8) hours worked shall be paid at one and one-half times the hourly rate. All hours worked on Sundays and Holidays shall be paid at double the hourly rate of wage.

S. The first ten (10) hours worked on Saturdays shall be paid at one and one-half times the hourly rate of wage. In the event the job is down due to weather conditions, or other conditions beyond the control of the Employer, then Saturday may be worked at the straight time rate, for the first eight (8) hours, or the first ten (10) hours when a four day ten hour workweek has been established.

All hours worked Monday through Saturday over twelve (12) hours and all hours worked on Sundays and holidays shall be paid at double the hourly rate of wage.

When an employee returns to work without a break of eight (8) hours since their previous shift, all such time shall be a continuation of shift and paid at the applicable overtime rate until such time as the employee has had a break of eight (8) hours.

Holiday Codes

5. A. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, and Christmas Day (7).

B. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, the day before Christmas, and Christmas Day (8).

C. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).

D. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8).

H. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Day after Thanksgiving Day, And Christmas (6).

I. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6).

K. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, The Day Before Christmas, And Christmas Day (9).

L. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (8).

N. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, The Friday After Thanksgiving Day, And Christmas Day (9).

P. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday And Saturday After Thanksgiving Day, The Day Before Christmas, And Christmas Day (9). If A Holiday Falls On Sunday, The Following Monday Shall Be Considered As A Holiday.

Q. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6).

R. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Day After Thanksgiving Day, One-Half Day Before Christmas Day, And Christmas Day. (7 1/2).

S. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, And Christmas Day (7).

Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8).

G. Paid Holidays: New Year's Day, Martin Luther King Jr. Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and Christmas Eve Day (11).

H. Paid Holidays: New Year's Day, New Year's Eve Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday After Thanksgiving Day, Christmas Day, The Day After Christmas, And A Floating Holiday (10).

Holiday Codes Continued

7. T. Paid Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Last Working Day Before Christmas Day, And Christmas Day (9).

Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (7). If a holiday falls on Saturday, the preceding Friday shall be considered as the holiday. If a holiday falls on Sunday, the following Monday shall be considered as the holiday.

A. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any Holiday Which Falls On A Sunday Shall Be Observed As A Holiday On The Following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

B. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

C. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

D. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (8). Unpaid Holidays: President's Day. Any paid holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any paid holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

E. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

F. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the last working day before Christmas day and Christmas day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

G. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day (6). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

H. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

I. Holidays: New Year's Day, President's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Day Before Christmas Day And Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

Holiday Codes Continued

7. J. Holidays: New Year's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day (6). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

K. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

L. Holidays: New Year's Day, Memorial Day, Labor Day, Independence Day, Thanksgiving Day, the Last Work Day before Christmas Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

N. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. When Christmas falls on a Saturday, the preceding Friday shall be observed as a holiday.

P. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, And Christmas Day (7). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

Q. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

S. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Friday after Thanksgiving Day, Christmas Day, the Day after Christmas, and A Floating Holiday (9). If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.

V. Holidays: New Year's Day, President's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, the day before or after Christmas, and the day before or after New Year's Day. If any of the above listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.

W. Holidays: New Year's Day, Day After New Year's, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Eve Day, Christmas Day, the day after Christmas, the day before New Year's Day, and a Floating Holiday.

X. Holidays: New Year's Day, Day before or after New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and the day before or after Christmas day. If a holiday falls on a Saturday or on a Friday that is the normal day off, then the holiday will be taken on the last normal workday. If the holiday falls on a Monday that is the normal day off or on a Sunday, then the holiday will be taken on the next normal workday.

Y. Holidays: New Year's Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day. (8) If the holiday falls on a Sunday, then the day observed by the federal government shall be considered a holiday and compensated accordingly.

Holiday Codes Continued

7. Z. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, Christmas Eve, and Christmas Day (9). Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday. Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

15. G. New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, the last scheduled workday before Christmas, and Christmas Day (9). If any of the listed holidays falls on a Sunday, the day observed by the Nation shall be considered a holiday and compensated accordingly.

H. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, the Last Working Day before Christmas Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

I. Holidays: New Year's Day, President's Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, The Friday After Thanksgiving Day, The Day Before Christmas Day And Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

J. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

K. Holidays: New Year's Day, Memorial Day, Independence Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, And Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. Any holiday which falls on a Saturday shall be observed as a holiday on the preceding Friday.

L. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

M. Holidays: New Year's Day, Martin Luther King Jr. Day, Independence Day, Memorial Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Eve Day and Christmas Day (9). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday. If any of the listed holidays falls on a Saturday, the preceding Friday shall be a regular work day.

N. Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day (8). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

O. Holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday and Saturday after Thanksgiving Day, the day before Christmas day, and Christmas Day (10). Any holiday which falls on a Sunday shall be observed as a holiday on the following Monday.

Note Codes

8. D. Workers working with supplied air on hazmat projects receive an additional $1.00 per hour.

L. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $0.75, Level B: $0.50, And Level C: $0.25.

M. Workers on hazmat projects receive additional hourly premiums as follows: Levels A & B: $1.00, Levels C & D: $0.50.

N. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $1.00, Level B: $0.75, Level C: $0.50, And Level D: $0.25.

S. Effective August 31, 2012 – A Traffic Control Supervisor shall be present on the project whenever flagging or spotting or other traffic control labor is being utilized. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. This classification is only effective on or after August 31, 2012.

T. Effective August 31, 2012 – A Traffic Control Laborer performs the setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control vehicular, bicycle, and pedestrian traffic during construction operations. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. This classification is only effective on or after August 31, 2012.

U. Workers on hazmat projects receive additional hourly premiums as follows – Class A Suit: $2.00, Class B Suit: $1.50, And Class C Suit: $1.00. Workers performing underground work receive an additional $0.40 per hour for any and all work performed underground, including operating, servicing and repairing of equipment. The premium for underground work shall be paid for the entire shift worked. Workers who work suspended by a rope or cable receive an additional $0.50 per hour. The premium for work suspended shall be paid for the entire shift worked. Workers who do “pioneer” work (break open a cut, build road, etc.) more than one hundred fifty (150) feet above grade elevation receive an additional $0.50 per hour.

V. In addition to the hourly wage and fringe benefits, the following depth and enclosure premiums shall be paid. The premiums are to be calculated for the maximum depth and distance into an enclosure that a diver reaches in a day. The premiums are to be paid one time for the day and are not used in calculating overtime pay.

Depth premiums apply to depths of fifty feet or more. Over 50' to 100' - $2.00 per foot for each foot over 50 feet. Over 101' to 150' - $3.00 per foot for each foot over 101 feet. Over 151' to 220' - $4.00 per foot for each foot over 220 feet. Over 221' - $5.00 per foot for each foot over 221 feet.

Enclosure premiums apply when divers enter enclosures (such as pipes or tunnels) where there is no vertical ascent and is measured by the distance travelled from the entrance. 25’ to 300’ - $1.00 per foot from entrance. 300’ to 600’ - $1.50 per foot beginning at 300’. Over 600’ - $2.00 per foot beginning at 600’.

W. Meter Installers work on single phase 120/240V self-contained residential meters. The Lineman/Groundmen rates would apply to meters not fitting this description.

Note Codes Continued

X. Workers on hazmat projects receive additional hourly premiums as follows - Class A Suit: $2.00, Class B Suit: $1.50, Class C Suit: $1.00, and Class D Suit: $0.50. Special Shift Premium: Basic hourly rate plus $2.00 per hour.

When due to conditions beyond the control of the Employer or when an owner (not acting as the contractor), a government agency or the contract specifications requires that work can only be performed outside the normal 5 am to 6pm shift, then the special shift premium will be applied to the basic hourly rate. When an employee works on a special shift, they shall be paid a special shift premium for each hour worked unless they are in OT or Double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

Y. Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay.

Swinging Stage/Boatswains Chair: Employees working on a swinging state or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents ($0.75) per hour above the classification rate.

Z. Workers working with supplied air on hazmat projects receive an additional $1.00 per hour.

Special Shift Premium: Basic hourly rate plus $2.00 per hour. When due to conditions beyond the control of the Employer or when an owner (not acting as a contractor), a government agency or the contract specifications require that more than (4) hours of a special shift can only be performed outside the normal 6 am to 6pm shift, then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they will be paid a special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

9. A. Workers working with supplied air on hazmat projects receive an additional $1.00 per hour.

Special Shift Premium: Basic hourly rate plus $2.00 per hour. When due to conditions beyond the control of the Employer or when an owner (not acting as the contractor), a government agency or the contract specifications require that more than four (4) hours of a special shift can only be performed outside the normal 6 am to 6pm shift, then the special shift premium will be applied to the basic straight time for the entire shift. When an employee works on a special shift, they shall be paid a special shift premium for each hour worked unless they are in overtime or double-time status. (For example, the special shift premium does not waive the overtime requirements for work performed on Saturday or Sunday.)

Certified Crane Operator Premium: Crane operators requiring certifications shall be paid $0.50 per hour above their classification rate.

Boom Pay Premium: All cranes including tower shall be paid as follows based on boom length:

(A) – 130’ to 199’ – $0.50 per hour over their classification rate.
(B) – 200’ to 299’ – $0.80 per hour over their classification rate.
(C) – 300’ and over – $1.00 per hour over their classification rate.

Note Codes Continued

B. The highest pressure registered on the gauge for an accumulated time of more than fifteen (15) minutes during the shift shall be used in determining the scale paid.

Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay. Swinging Stage/Boatswains Chair: Employees working on a swinging stage or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents ($0.75) per hour above the classification rate.

C. Tide Work: When employees are called out between the hours of 6:00 p.m. and 6:00 a.m. to work on tide work (work located in the tide plane) all time worked shall be at one and one-half times the hourly rate of pay. Swinging Stage/Boatswains Chair: Employees working on a swinging stage or boatswains chair or under conditions that require them to be tied off to allow their hands to be free shall receive seventy-five cents ($0.75) per hour above the classification rate.

Effective August 31, 2012 – A Traffic Control Supervisor shall be present on the project whenever flagging or spotting or other traffic control labor is being utilized. A Traffic Control Laborer performs the setup, maintenance and removal of all temporary traffic control devices and construction signs necessary to control vehicular, bicycle, and pedestrian traffic during construction operations. Flaggers and Spotters shall be posted where shown on approved Traffic Control Plans or where directed by the Engineer. All flaggers and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana, or Idaho. These classifications are only effective on or after August 31, 2012.

D. Industrial Painter wages are required for painting within industrial facilities such as treatment plants, pipelines, towers, dams, bridges, power generation facilities and manufacturing facilities such as chemical plants, etc., or anywhere abrasive blasting is necessary to prepare surfaces, or hazardous materials encapsulation is required.

9. E. Heavy Construction includes construction, repair, alteration or additions to the production, fabrication or manufacturing portions of industrial or manufacturing plants, hydroelectric or nuclear power plants and atomic reactor construction. Workers on hazmat projects receive additional hourly premiums as follows -Level A: $1.00, Level B: $0.75, Level C: $0.50, And Level D: $0.25.

F. Industrial Painter wages are required for painting within industrial facilities such as treatment plants, pipelines, towers, dams, power generation facilities and manufacturing facilities such as chemical plants, etc., or anywhere abrasive blasting is necessary to prepare surfaces, or hazardous materials encapsulation is required.

H. One (1) person crew shall consist of a Party Chief. (Total Station or similar one (1) person survey system). Two (2) person survey party shall consist of a least a Party Chief and a Chain Person. Three (3) person survey party shall consist of at least a Party Chief, an Instrument Person, and a Chain Person.

APPENDIX B

Owner-Furnished Equipment Documentation

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HOFFMAN LAMSON

SUBMITTAL
FOR CENTRIFUGAL BLOWER

CUSTOMER: City of Everett Water Filtration

PURCHASE ORDER: 22074

MANUFACTURER: **Gardner Denver**
200 Simko Blvd
Charleroi, PA 15022
Phone: (724) 239-1500

PROJECT MANAGER: Mark Gentile
Phone 724.239.1609
E-mail: mark.gentile@irco.com

GARDNER DENVER SALES ORDER NO.: 5150126

MANUFACTURER'S REPRESENTATIVE: Globe Sampson
John Darch

DATE PREPARED: June 12, 2023

Table of Contents

BLOWERS
&
ACCESSORIES

HOFFMAN LAMSON CF SELECT plus

1260, 5 Stage(s) (5 x 1004) , 3550 RPM

Date: 2/7/2022

Project Name: City of Everett Backup Blower

Customer:

Sales Order Number: Duplicate SO#62137 (Serial # 930427)

Application Engineer: AAT

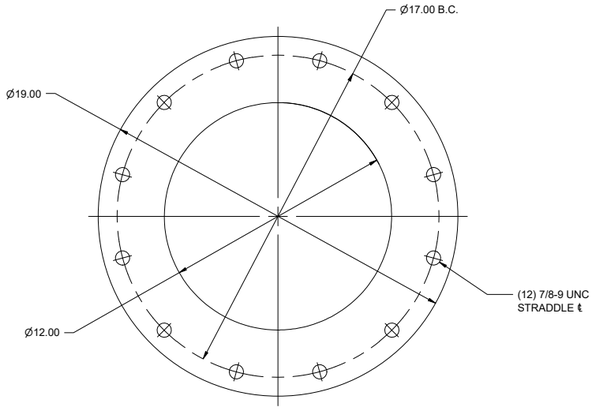
Comment:

AMBIENT GAS PARAMETERS	ENGLISH UNITS	METRIC UNITS
Molecular Weight	28.742 lbm/lbmol	28.742 kg/kgmol
R Value	53.755 ft.lbf/lbm.R	0.289 kJ/kg.K
Density	0.069 lbm/ft^3	1.104 kg/m^3
Sp. Heat @ Const. P	0.243 BTU/lbm.R	1.016 kJ/kg.K
Ratio of Sp. Heats	1.397	1.397
Partial Pres. of Vapor	0.287	0.287

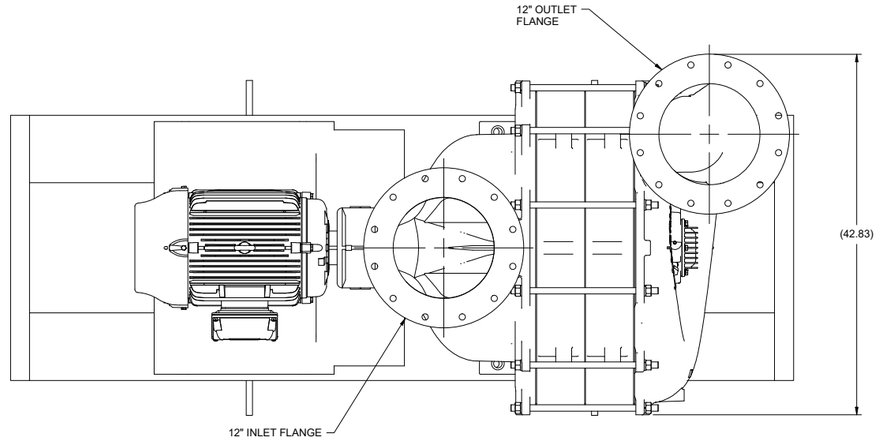
GAS MIX:	VOL
Air	100

Inlet Set 1

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	14.40 PSIA	14.40 PSIA	0.99 bar a
Relative Humidity	30%	30%	30%
Ambient Temperature	100 F	100.00 F	37.78 C
Inlet Pressure	14.20 PSIA	14.20 PSIA	-13.79 mbar g
Inlet Flow	3825 SCFM	4249 ICFM	7219 m3/h
Discharge Pressure	5.8 PSIG	5.80 PSIG	0.40 bar g
MEASURED VALUES	**ORIGINAL UNITS**	**ENGLISH UNITS**	**METRIC UNITS**
Surge Flow Rate	1660 SCFM	1845 ICFM	3134 m3/h
Surge Pressure	6.44 PSIG	6.44 PSIG	0.44 bar g
Pressure Rise to Surge	0.64 PSIG	0.64 PSIG	0.04 bar g
Max. Vol. Turndown	56.59%	56.59%	56.59%
Pressure @ Design	5.80 PSIG	5.80 PSIG	0.40 bar g
Power @ Design	141.29 HP	141.29 HP	105.36 KW
Efficiency @ Design	68.93%	68.93%	68.93%
Temperature @ Design	185.56 F	185.56 F	85.31 C



INLET/OUTLET FLANGE DETAIL



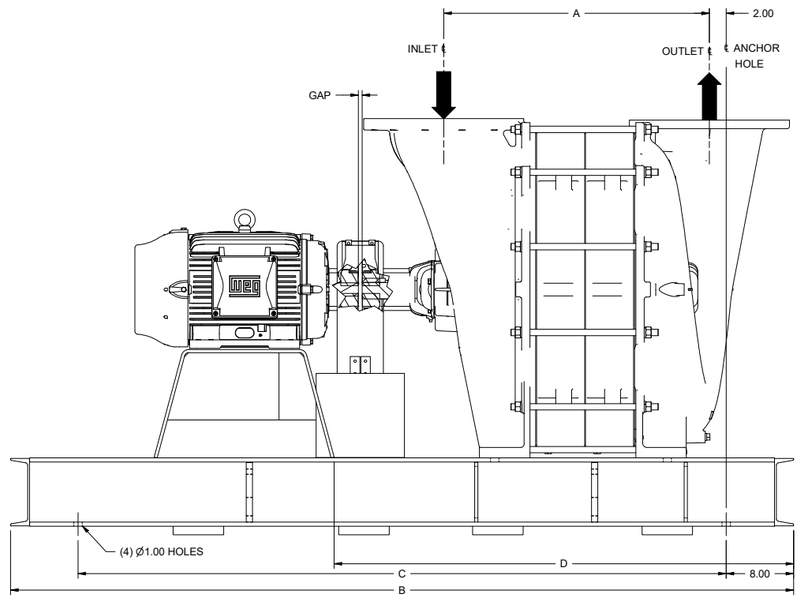
BLOWER DATA
MODEL NO.: 1260 AIR & GAS UNITS LUBRICATION: GREASE INLET POSITION: STD OUTLET POSITION: STD DRIVE SHAFT POSITION: INLETT

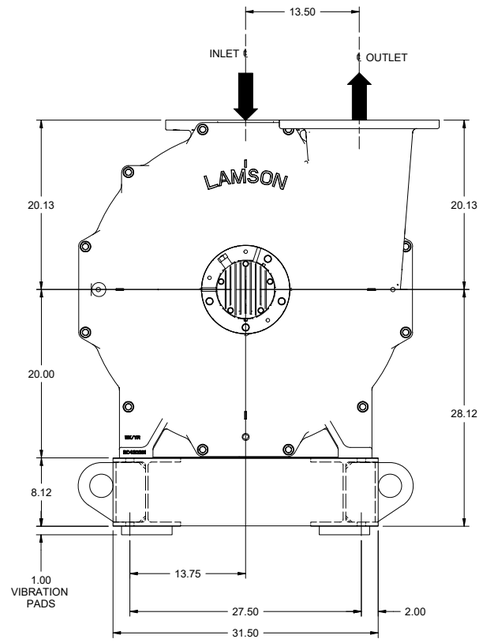
MOTOR DATA
HORSEPOWER: SEE CHART FRAME: SEE CHART ENCLOSURE: TEFC VOLTAGE: 230/460/575 HERTZ: 60 PHASE: 3

DIRECT DRIVE DATA
COUPLING MFG.: REX OMEGA COUPLING SIZE: SEE CHART GAP: SEE CHART

BLOWER DATA
TOTAL ESTIMATED WEIGHT: SEE CHART

NOTES
1. DIMENSIONS SHOWN IN INCHES AND [mm]. 2. DO NOT BOLT DOWN IF STUDS ARE USED TO POSITION THE MACHINE, DO NOT FASTEN DOWN WITH NUTS. NEVER GROUT BASE IN CONCRETE. 3. FLANGE DIMENSIONS CONFORM TO 125 POUND ANSI CAST IRON FLANGED FITTINGS. 4. INERTIA - SEE CHART LB-FT² [KG-M²]





CUSTOMER CONNECTION

BLOWER SIZE	284/6TS	324/6TS	364/5TS	404/5TS	444/5TS	447/9TS	A	B	C	D	GAP	CPL SIZE	TOTAL WEIGHT	INERTIA
1263-A/GDGI	X						31.56	93	77	54.58	0.44	E20	3434	47 [1.96]
1263-A/GDGI		X					31.56	93	77	55.46	0.44	E20	3610	47 [1.96]
1263-A/GDGI			X				31.56	93	77	56.25	0.44	E20	3885	47 [1.96]
1263-A/GDGI				X			31.56	93	77	57.80	0.50	E30	4093	47 [1.96]
1263-A/GDGI					X		31.56	93	77	60.50	0.50	E30	4823	47 [1.96]
1263-A/GDGI						X	31.56	101	85	60.50	0.50	E40	5711	47 [1.96]
1264-A/GDGI	X						37.38	101	85	60.40	0.44	E20	3901	62 [2.59]
1264-A/GDGI		X					37.38	101	85	61.28	0.44	E21	4077	62 [2.59]
1264-A/GDGI			X				37.38	101	85	62.07	0.44	E22	4352	62 [2.59]
1264-A/GDGI				X			37.38	101	85	63.62	0.50	E30	4560	62 [2.59]
1264-A/GDGI					X		37.38	101	85	66.32	0.50	E30	5290	62 [2.59]
1264-A/GDGI						X	37.38	117	101	66.32	0.50	E40	6338	62 [2.59]
1265-A/GDGI	X						43.19	117	101	66.22	0.44	E20	4528	77 [3.24]
1265-A/GDGI		X					43.19	117	101	67.89	0.44	E21	4704	77 [3.24]
1265-A/GDGI			X				43.19	117	101	67.89	0.44	E22	4979	77 [3.24]
1265-A/GDGI				X			43.19	117	101	69.44	0.50	E30	5187	77 [3.24]
1265-A/GDGI					X		43.19	117	101	72.14	0.50	E30	5917	77 [3.24]
1265-A/GDGI						X	43.19	117	101	72.14	0.50	E40	6758	77 [3.24]
1266-A/GDGI	X						49.00	101	85	72.04	0.44	E20	4741	92 [3.88]
1266-A/GDGI		X					49.00	117	101	73.71	0.44	E21	5124	92 [3.88]
1266-A/GDGI			X				49.00	117	101	73.71	0.44	E22	5399	92 [3.88]
1266-A/GDGI				X			49.00	117	101	75.26	0.50	E30	5607	92 [3.88]
1266-A/GDGI					X		49.00	117	101	77.96	0.50	E30	6337	92 [3.88]
1266-A/GDGI						X	49.00	123	101	77.96	0.50	E40	7236	92 [3.88]
1267-A/GDGI	X						54.81	117	101	77.86	0.44	E20	5368	108 [4.52]
1267-A/GDGI		X					54.81	117	101	79.53	0.44	E21	5544	108 [4.52]
1267-A/GDGI			X				54.81	117	101	79.53	0.44	E22	5819	108 [4.52]
1267-A/GDGI				X			54.81	123	107	81.08	0.50	E30	6085	108 [4.52]
1267-A/GDGI					X		54.81	123	107	83.78	0.50	E30	6815	108 [4.52]
1267-A/GDGI						X	54.81	132	116	83.78	0.50	E40	7708	108 [4.52]

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASED, C/M 1125062	3/22/19	

- UNLESS OTHERWISE NOTED -

DIMENSIONAL UNITS ARE: INCHES

- TOLERANCES -

GENERAL	MOUNTING HOLES ≤ 4 STAGES	MOUNTING HOLES > 4 STAGES	PIPE CONNECTION LOCATIONS ≤ 2-IN NPS	PIPE CONNECTION LOCATIONS > 2-IN NPS
± 0.13 [3.2]	± 0.06 [1.6]	± 0.13 [3.2]	± 0.25 [6.4]	± 0.50 [12.7]

DWN	SSH	DATE 3/22/19
CHKR	RWG	3/22/19
APVD DSGN		
APVD ENGR		
APVD QA		
PROJECTION		1 1

Gardner Denver Nash LLC

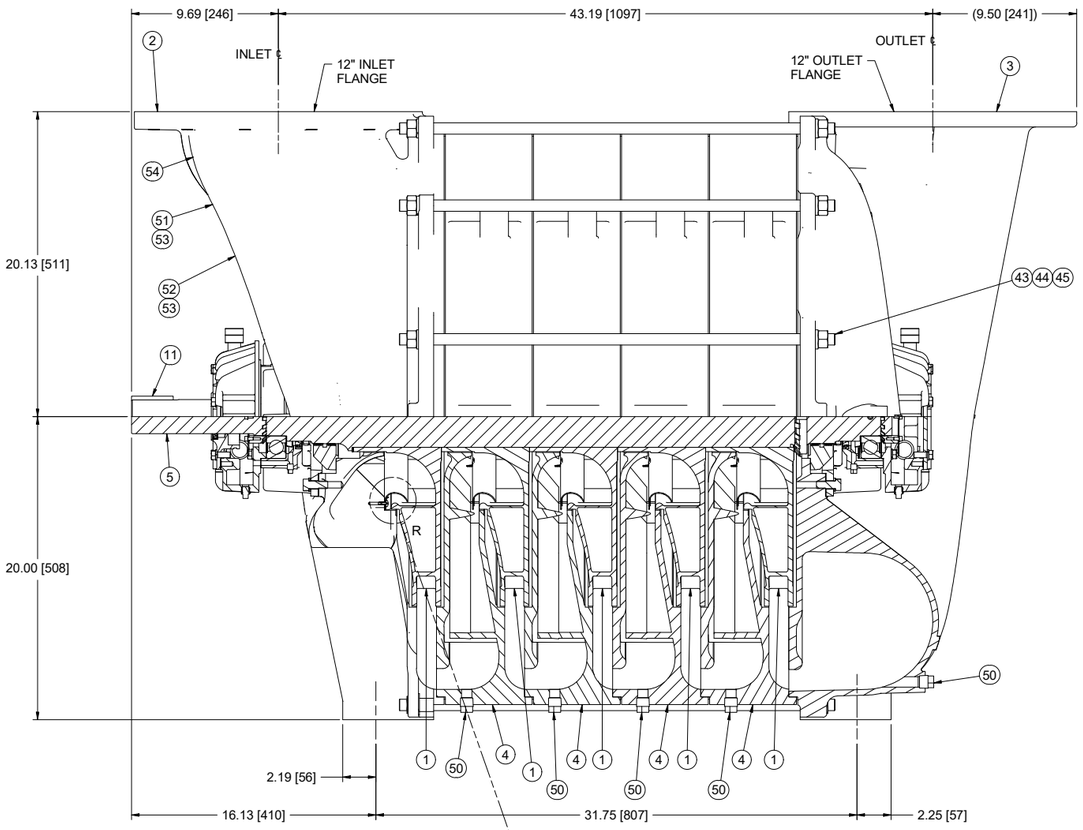
STD OUTLINE, 1260 AIR AND GAS, INLET DRIVE

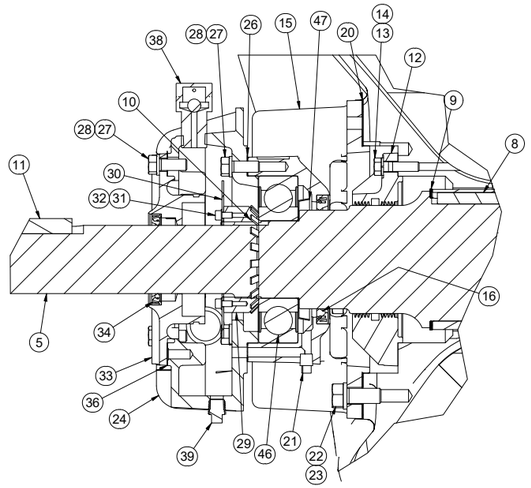
SIZE	FSCM NO.	DWG NO.	REV
D	42280	1260 PACKAGE	A

SCALE NTS SHEET 1 OF 1

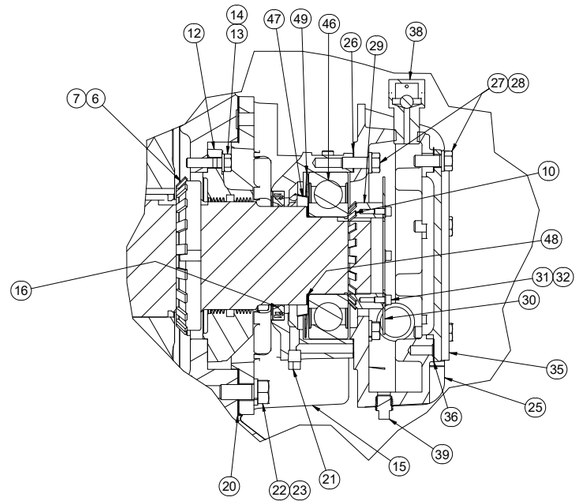
BLOWER DATA
MODEL NO.: 1265-ADOI LUBRICATION: OIL INLET POSITION: STD OUTLET POSITION: STD DRIVE SHAFT POSITION: INLET

BLOWER DATA
1. DIMENSIONS SHOWN IN INCHES AND [mm] 2. FLANGE DIMENSIONS CONFORM TO 125 POUND ANSI CAST IRON FLANGED FITTINGS 3. SHAFT 2 1/4" DIA. WITH 1/2" KEY 4. CW ROTATION WIHEN FACING SHAFT 5. BLOWER WEIGHT: 3,100 LBS.



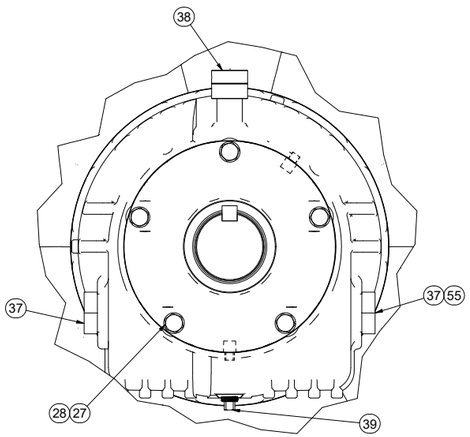


INLET BEARING HOUSING DETAIL

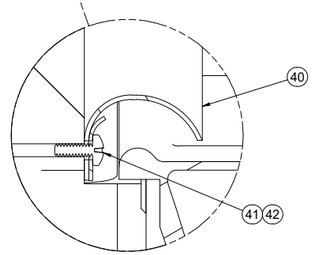


OUTLET BEARING HOUSING DETAIL

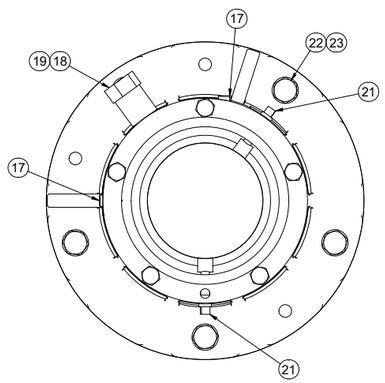
PARTS LIST		
ITEM	QTY	DESCRIPTION
1	5	IMPELLERS PER CONFIGURATOR
2	1	HEAD,INLET,1210-1260,POS.1
3	1	HEAD,OUTLET,1210-1260,POS.1,1/2"DRN
4	4	SECTION,INTER,1260,1/2" X-DRAIN
5	1	SHAFT,1260, 5 ST.GR/OIL
6	1	LOCKWASHER,W-19,STEEL
7	1	LOCKNUT,AN-19, STEEL
8	1	KEY,3/8"SQ X 27.75" LG
9	3	SHIM,IMPELLER,1260,22GA.CRS
10	2	LOCKWASHER,W-13,STEEL
11	1	KEY,1/2"SQ X 2.75 LG
12	2	LABYRINTH,MACHINED,650,860,870,1260
13	10	SCREW,HH CAP,5/16-18X1.25 LG ZN GR5
14	10	WASHER,LOCK,MED5/16
15	2	HSG-BRG,860,870,1260,ASSY,AIR,LIP SEAL
16	2	SEAL-OIL,3.25ID,4.25OD,.375W VITON 32392
17	4	SCREW, SET 3/8-24X3/4",STEEL,CONE POINT
18	2	PLUG, 3/4-10 STANDARD RTD CONN.(S.S.)
19	2	WASHER,COPPER CRUSH,3/4-10 RTD SEALING
20	2	GASKET HEAD 600-1250 SERIES
21	4	PLUG,PIPE,1/8",SQ.HD,STN STEEL
22	10	SCREW,HH CAP,1/2-13X1.25 LG ZN GR5
23	10	WASHER,LOCK,MED1/2 ZN
24	1	RESERVOIR,OIL,860-1260,LG. LIP,SIGHT GL
25	1	RESERVOIR,OIL,860-1260,SH. LIP,SIGHT GL
26	2	GASKET,BEARING HOUSING,860,870,1260
27	20	SCREW,HH CAP,3/8-16X1.00 LG ZN GR5
28	20	WASHER,LOCK,MED3/8 ZN
29	2	SPACER, BEARING, 860/1260,STEEL
30	2	SLINGER,OIL,860/1260
31	8	SCREW,SOC HD,CAP,10-32X.375
32	8	WASHER,LOCK,INT.TOOTH,#10,STD,ZN*
33	1	CAP,RES,DE,LIPSL,810,50,60,70,1210,50,60
34	1	SEAL,OIL,2.25"SHAFT,C/R 22361,VITON
35	1	CAP,RESERVOIR,CLOSED END
36	2	GASKET,OIL RESERVOIR 600-1260
37	4	GLASS,SIGHT,OIL LEVEL,1"NPT BULLSEYE
38	2	VENT,CAP,AIR,1/2 NPT,KOWEL # 4P-000AV
39	2	PLUG PIPE 1/4" NPT MAGNETIC
40	5	RING,BAFFLE,1250/1260,STN.STEEL*
41	30	SCREW,PAN HD,PHIL,12-24X.50 STN.STL
42	30	WASHER,RETAINING,1250/1260/1800,SS
43	12	TIE ROD,3/4"R.B.,28-3/4"LG.STL
44	24	NUT, HEX,3/4 - 10 ZN
45	24	WASHER,LOCK,MED3/4 ZN
46	2	BEARING,RADIAL BALL,6313 C3,ABEC-1
47	2	SLINGER,860,870,1260
48	2	SHIM,BEARING,860/870/1260 .0164THK SS
49	1	WASHER,WAVY SPR,#W5408-053
50	5	PLUG,PIPE,1/2",SQ.HD.,304STN STEEL
51	1	NAMEPLATE,AEON CF,CAUTION,SS
52	1	NAMEPLATE,GD-ENG. PROD. DIV.,SERIAL
53	4	TACK,FAST.,#4139,1/4"HD,0.030-0.040"GRIP
54	1	DECAL,FACTORY SVC,AUTH PARTS,3X6
55	2	TAG,WARNING,OIL SG, UNIT SUPPLIED W/O OIL



RESERVOIR HOUSING DETAIL
(INLET/OUTLET END VIEW SHOWN)



DETAIL BAFFLE RING



BEARING HOUSING DETAIL
(INLET/OUTLET END VIEW SHOWN)

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASED, C/M 1125062	6/14/19	

- UNLESS OTHERWISE NOTED -

DIMENSIONAL UNITS ARE: INCHES

- TOLERANCES -

GENERAL	MOUNTING HOLES ≤ 4 STAGES	MOUNTING HOLES > 4 STAGES	PIPE CONNECTION LOCATIONS ≤ 2-IN NPS	PIPE CONNECTION LOCATIONS > 2-IN NPS
± 0.13 [3.2]	± 0.06 [1.6]	± 0.13 [3.2]	± 0.25 [6.4]	± 0.50 [12.7]

DWN	SSH	DATE 6/14/19
CHKR	RWG	6/14/19
APVD DSGN		
APVD ENGR		
APVD QA		

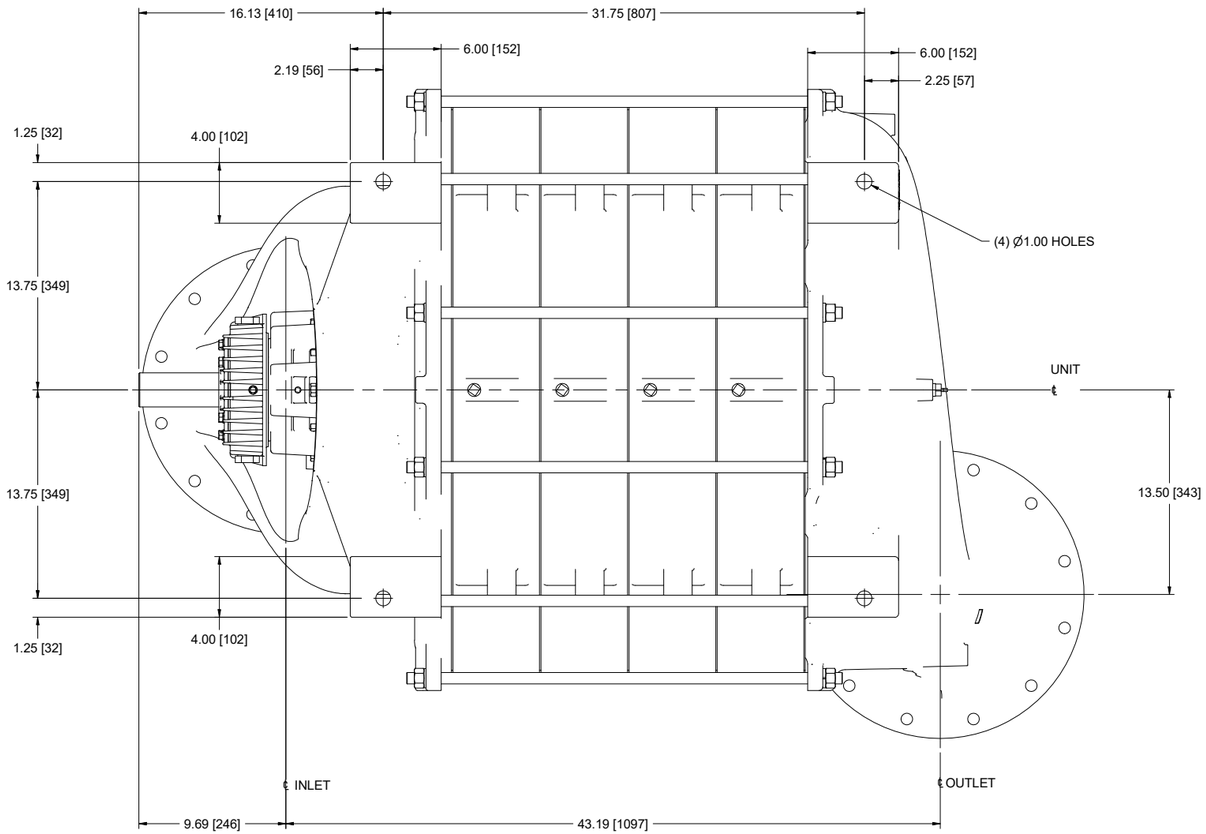
PROJECTION 1

Gardner Denver Nash LLC

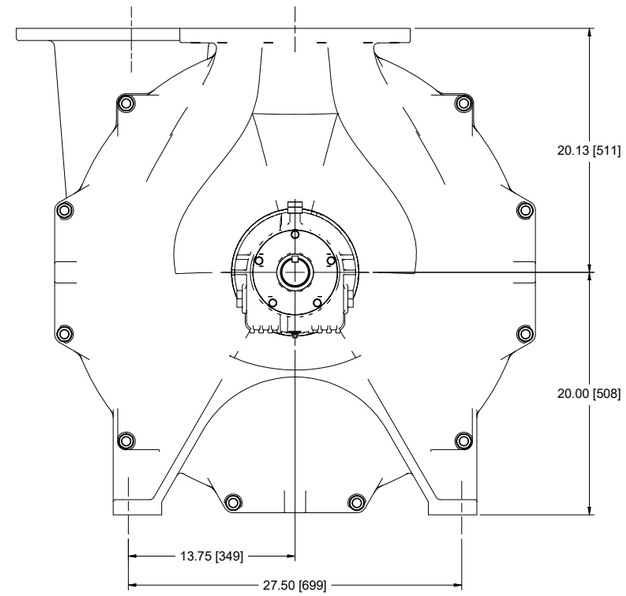
STD ASSY, 1265-ADOI, 1-1, LABY, OPEN BRG HSG

SIZE	FSCM NO.	DWG NO	REV
D	42280	1265-LABY-O-I-OIL	A

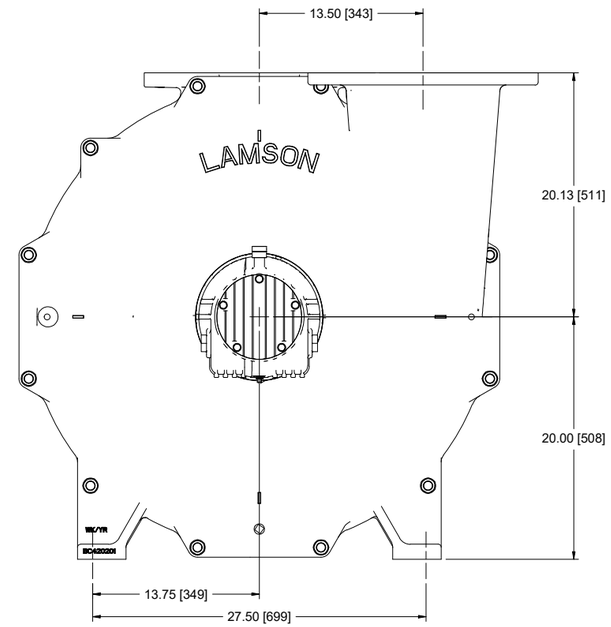
SCALE NTS | SHEET 1 OF 2



FOOT DIMENSIONS

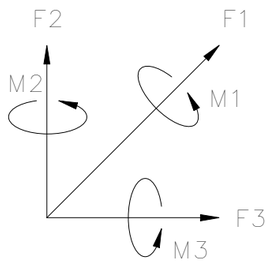


INLET HEAD - POSITION 1



OUTLET HEAD - POSITION 1

RECOMMENDED MAXIMUM ALLOWABLE FLANGE FORCES AND MOMENTS



INLET					
F1 PARALLEL TO SHAFT		F2 VERTICAL TO SHAFT		F3 HORIZONTAL 90° TO SHAFT	
100 LB	455 N-M	300 LB	1334 N-M	200 LB	890 N-M
M1 PARALLEL TO SHAFT		M2 VERTICAL TO SHAFT		M3 HORIZONTAL 90° TO SHAFT	
700 FT-LB	949 N-M	350 FT-LB	475 N-M	350 FT-LB	475 N-M

OUTLET					
F1 PARALLEL TO SHAFT		F2 VERTICAL TO SHAFT		F3 HORIZONTAL 90° TO SHAFT	
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M1 PARALLEL TO SHAFT		M2 VERTICAL TO SHAFT		M3 HORIZONTAL 90° TO SHAFT	
700 FT-LB	949 N-M	350 FT-LB	475 N-M	350 FT-LB	475 N-M

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASED, C/M 1125062	6/14/19	

- UNLESS OTHERWISE NOTED -

DIMENSIONAL UNITS ARE: INCHES

- TOLERANCES -

GENERAL	MOUNTING HOLES ≤ 4 STAGES	MOUNTING HOLES > 4 STAGES	PIPE CONNECTION LOCATIONS ≤ 2-IN NPS	PIPE CONNECTION LOCATIONS > 2-IN NPS
± 0.13 [3.2]	± 0.06 [1.6]	± 0.13 [3.2]	± 0.25 [6.4]	± 0.50 [12.7]

DWN	SSH	DATE 6/14/19
CHKR	RWG	6/14/19
APVD DSGN		
APVD ENGR		
APVD QA		

PROJECTION 1

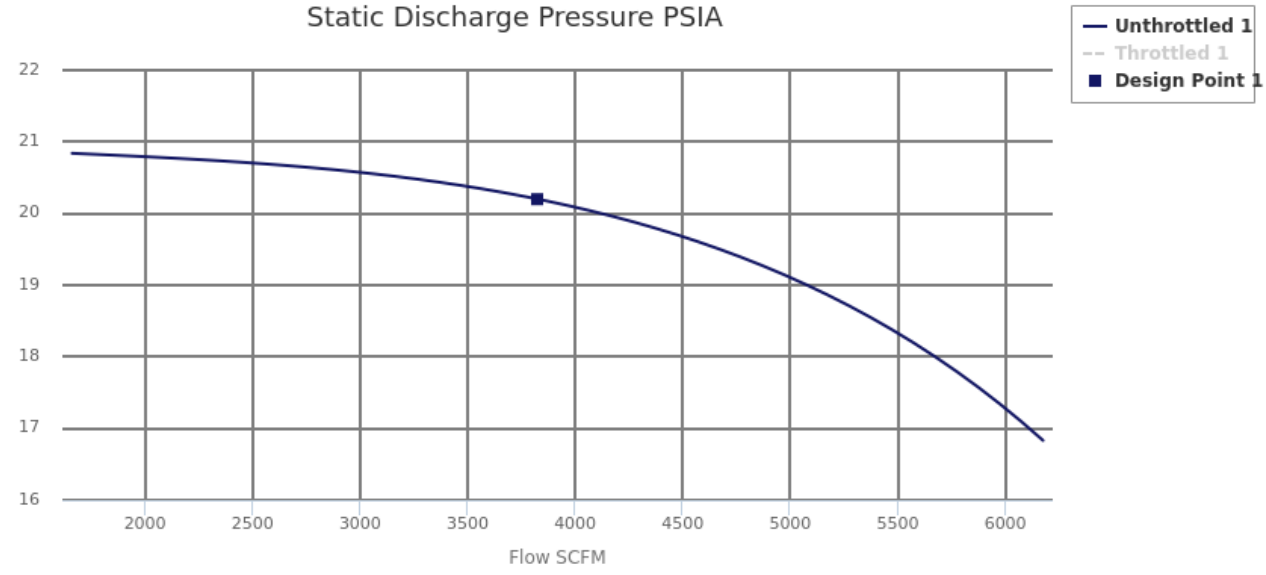
Gardner Denver Nash LLC

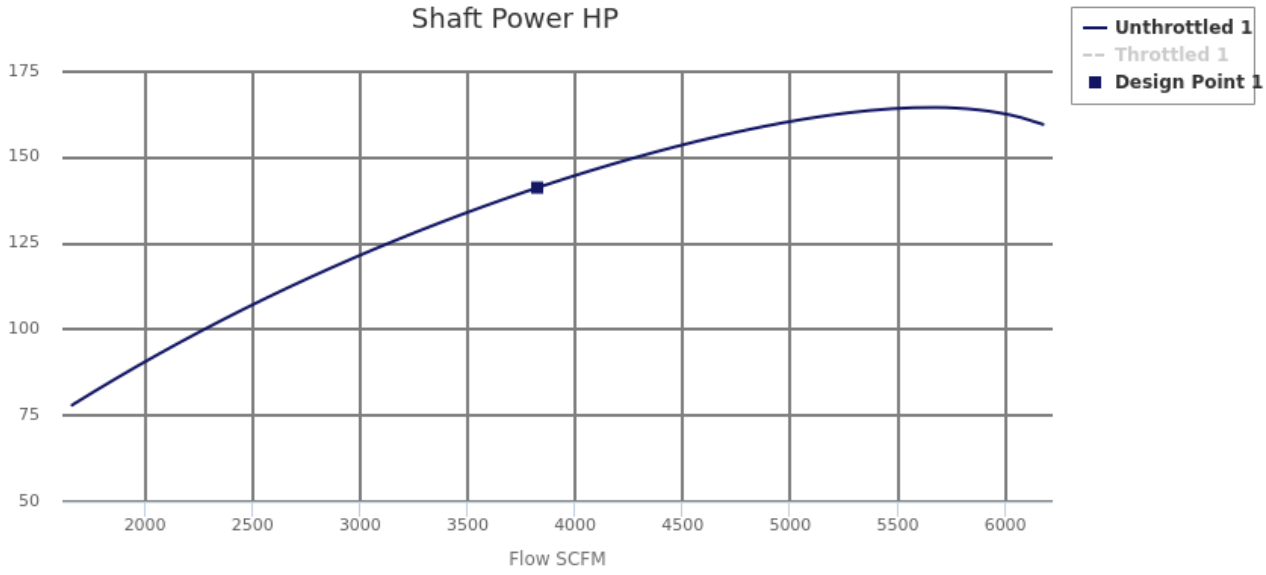
STD ASSY, 1265-ADOI, 1-1, LABY, OPEN BRG HSG

SIZE	FSCM NO.	DWG NO.	REV
D	42280	1265-LABY-O-I-OIL	A

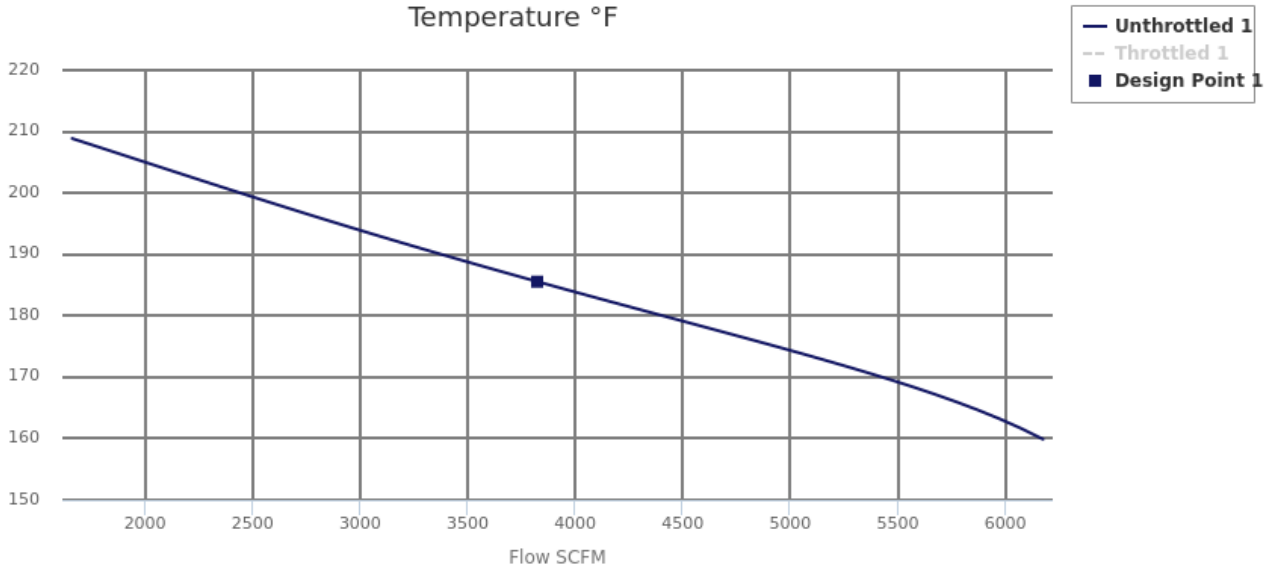
SCALE NTS SHEET 2 OF 2

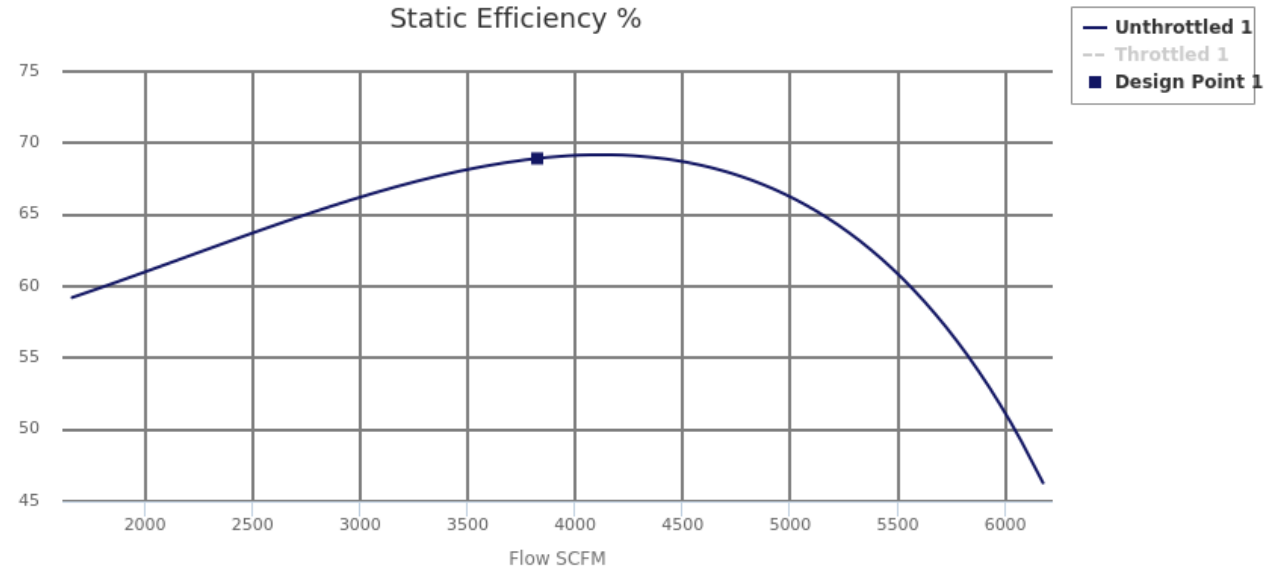
HOFFMAN LAMSON
CF SELECT plus

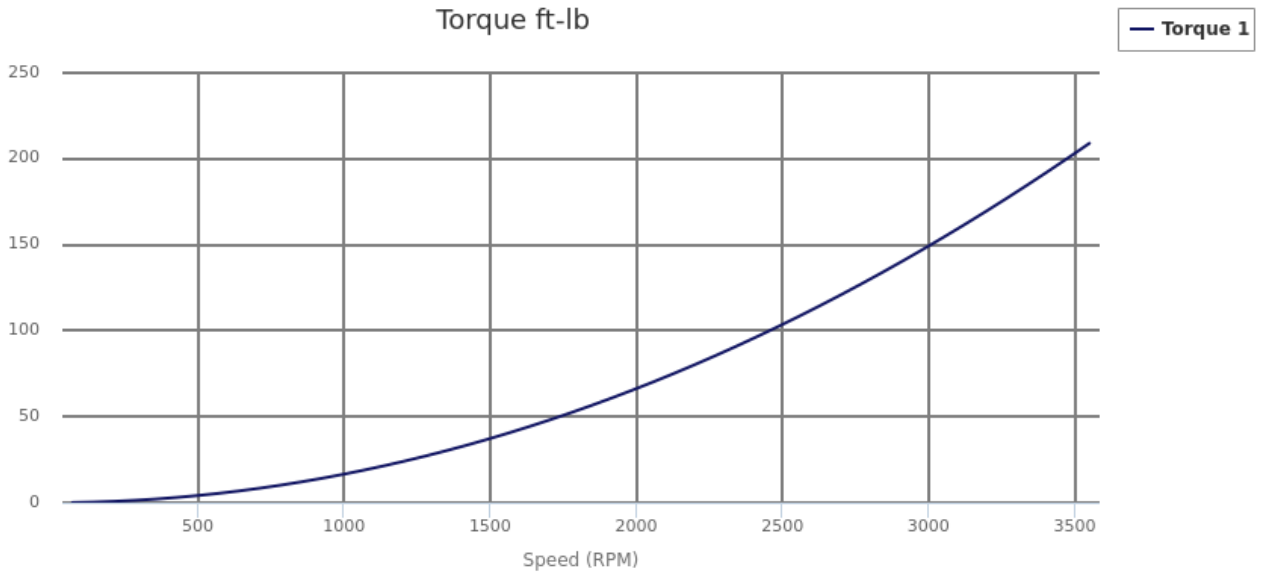




HOFFMAN LAMSON
CF SELECT plus







DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer :

Product line : W22

Product code : 11431289
Catalog # : 20036ET3G447TS-W22

Frame	: 445/7TS
Output	: 200 HP (150 kW)
Poles	: 2
Frequency	: 60 Hz
Rated voltage	: 460 V
Rated current	: 219 A
L. R. Amperes	: 1424 A
LRC	: 6.5x(Code G)
No load current	: 45.0 A
Rated speed	: 3570 rpm
Slip	: 0.83 %
Rated torque	: 40.7 kgfm
Locked rotor torque	: 210 %
Breakdown torque	: 229 %
Insulation class	: F
Service factor	: 1.15
Moment of inertia (J)	: 1.88 kgm²
Design	: B

Locked rotor time	: 25s (cold) 14s (hot)
Temperature rise	: 80 K
Duty cycle	: Cont.(S1)
Ambient temperature	: -20°C to +40°C
Altitude	: 1000 m.a.s.l.
Protection degree	: IP55
Cooling method	: IC411 - TEFC
Mounting	: F-1
Rotation¹	: Both (CW and CCW)
Noise level²	: 81.0 dB(A)
Starting method	: Direct On Line
Approx. weight³	: 928 kg

Output	25%	50%	75%	100%
Efficiency (%)	94.9	95.0	95.4	95.4
Power Factor	0.64	0.86	0.89	0.90

Foundation loads

Max. traction	: 519 kgf
Max. compression	: 1447 kgf

		Drive end	Non drive end
Bearing type	:	6314 C3	6314 C3
Sealing	:	WSeal	WSeal
Lubrication interval	:	4000 h	4000 h
Lubricant amount	:	27 g	27 g
Lubricant type	:	Mobil Polyrex EM	

Notes

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	03/02/2023		1 / 1	

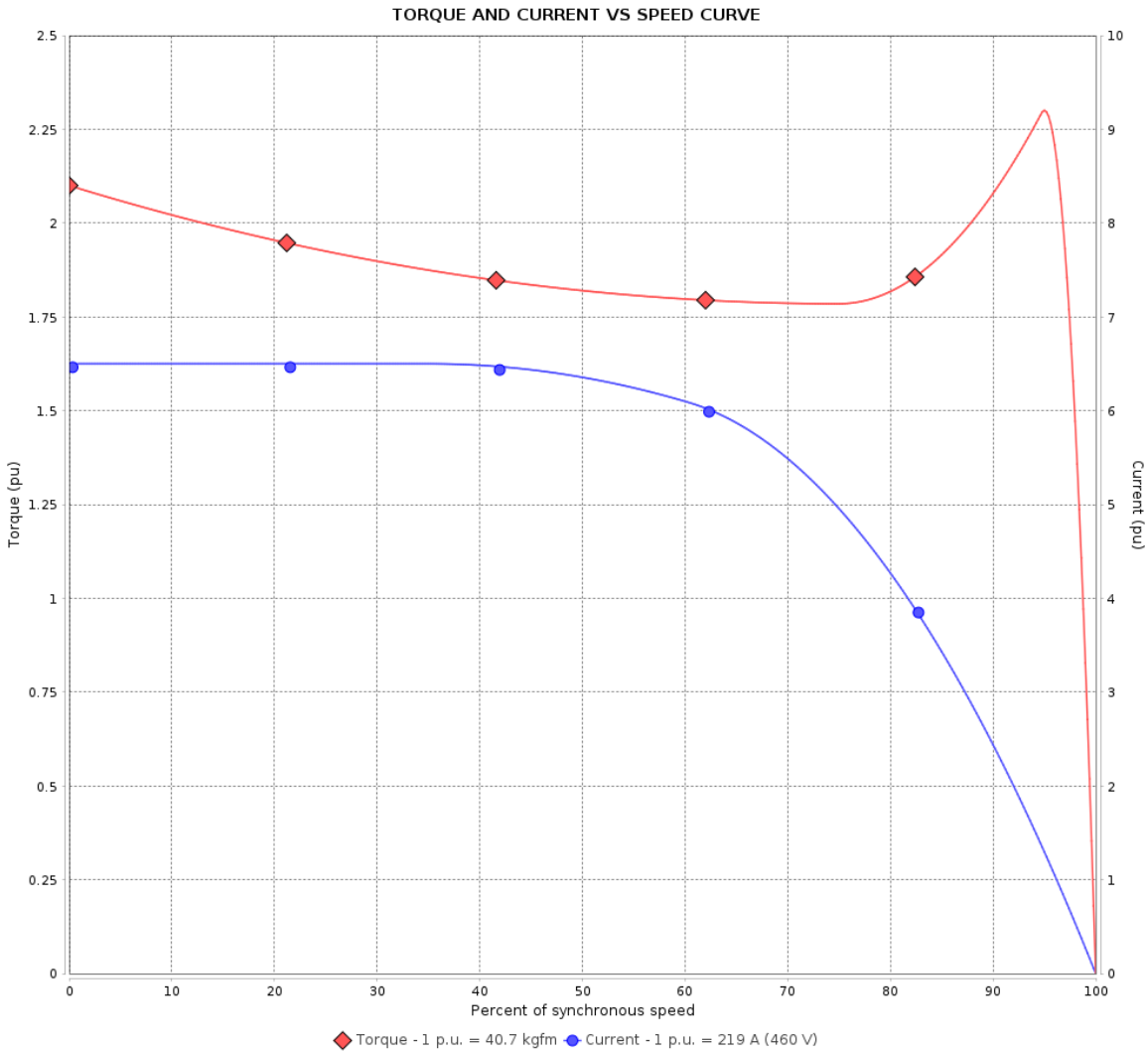
TORQUE AND CURRENT VS SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer :

Product line : W22

Product code : 11431289
Catalog # : 20036ET3G447TS-W22



Performance	: 460 V 60 Hz 2P		
Rated current	: 219 A	Moment of inertia (J)	: 1.88 kgm²
LRC	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 40.7 kgfm	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	: 1.15
Breakdown torque	: 229 %	Temperature rise	: 80 K
Rated speed	: 3570 rpm	Design	: B

Locked rotor time : 25s (cold) 14s (hot)

Rev.	Changes Summary	Performed	Checked	Date

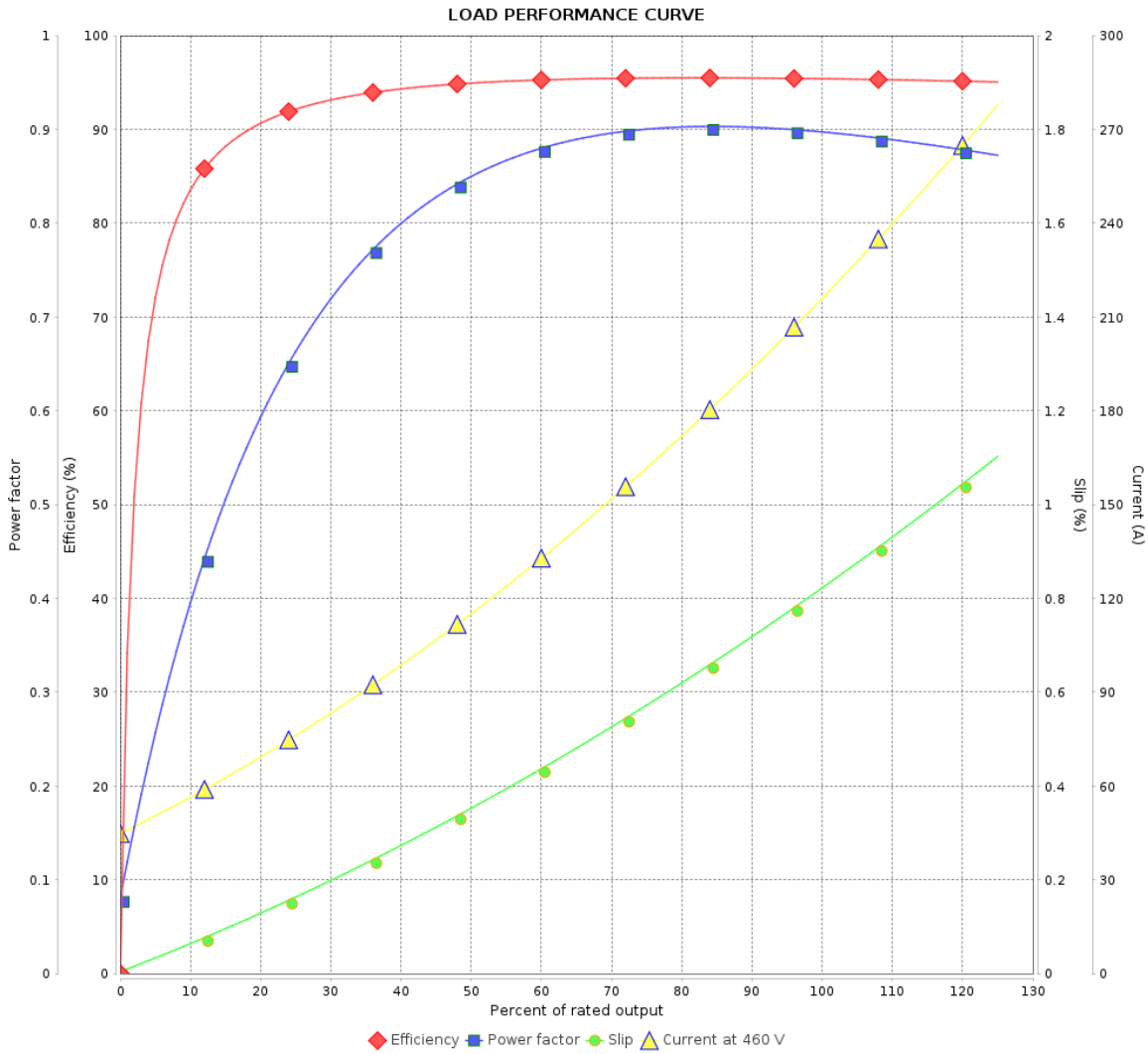
Performed by				
Checked by			Page	Revision
Date	03/02/2023		2 / 5	

LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W22	Product code :	11431289
		Catalog # :	20036ET3G447TS-W22



Performance	: 460 V 60 Hz 2P

Rated current	: 219 A	Moment of inertia (J)	: 1.88 kgm²
LRC	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 40.7 kgfm	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	: 1.15
Breakdown torque	: 229 %	Temperature rise	: 80 K
Rated speed	: 3570 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	03/02/2023		3 / 5	

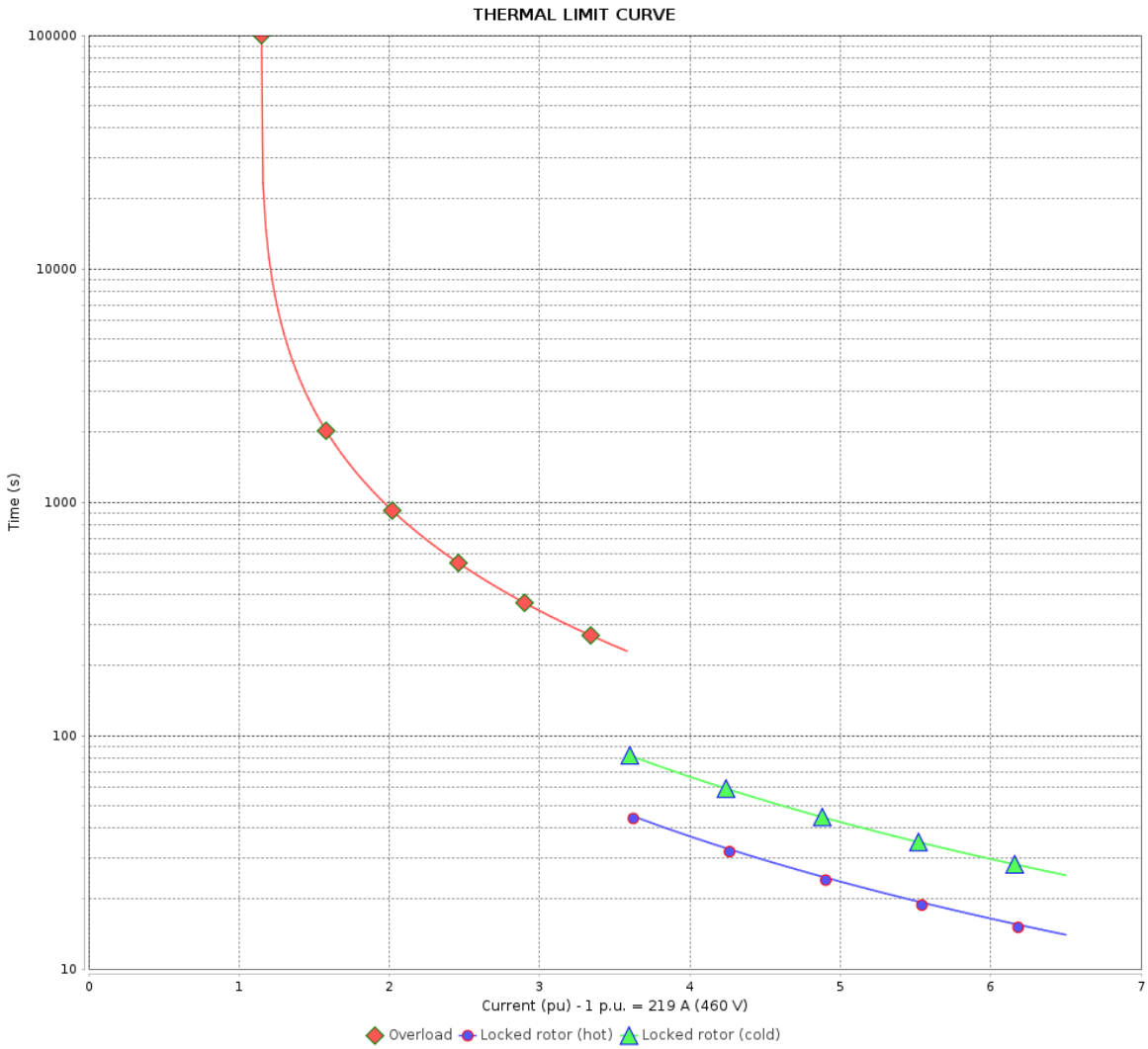
THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer :

Product line : W22

Product code : 11431289
Catalog # : 20036ET3G447TS-W22



Performance	: 460 V 60 Hz 2P		
Rated current	: 219 A	Moment of inertia (J)	: 1.88 kgm²
LRC	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 40.7 kgfm	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	: 1.15
Breakdown torque	: 229 %	Temperature rise	: 80 K
Rated speed	: 3570 rpm	Design	: B
Heating constant			
Cooling constant			

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
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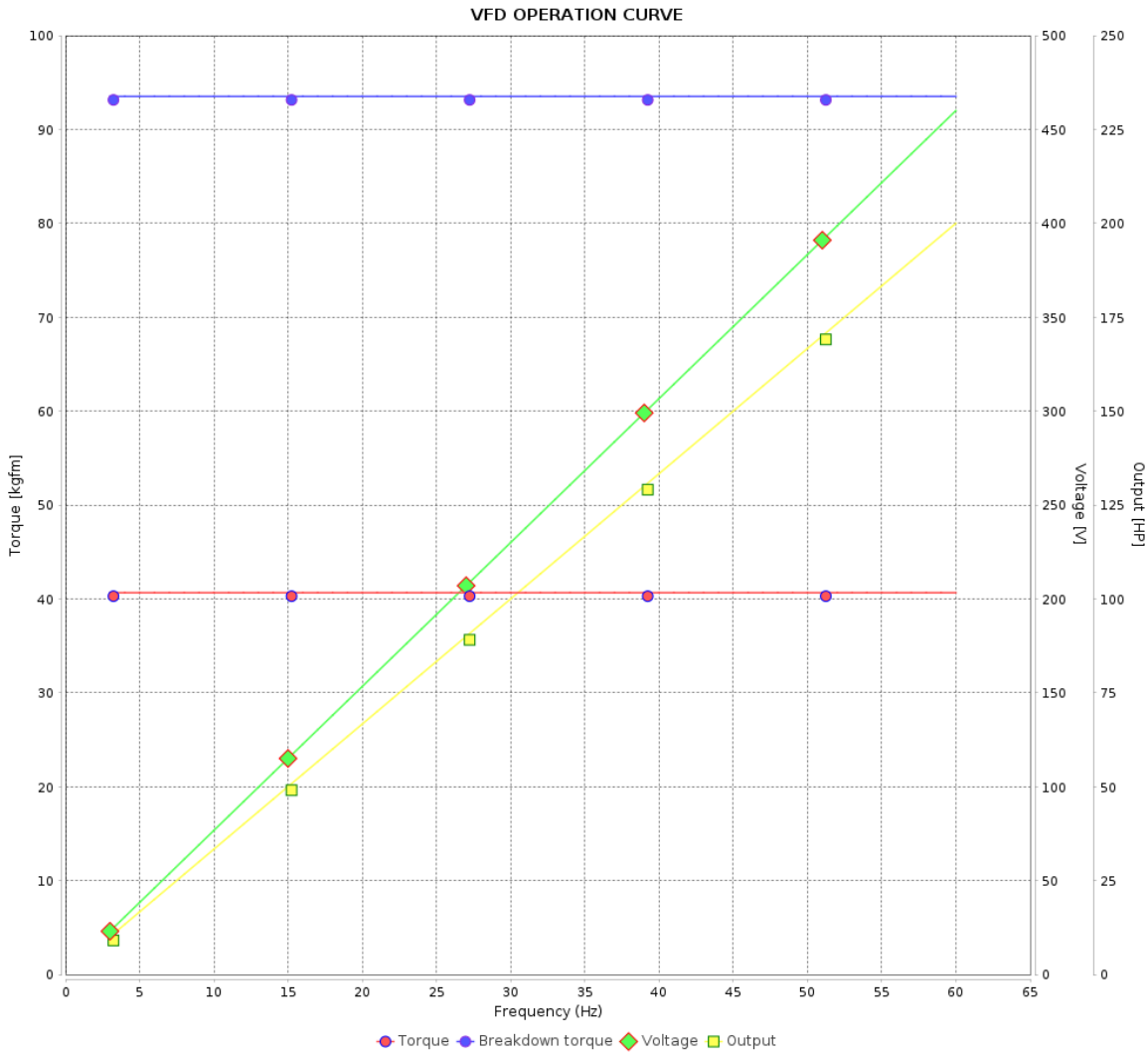
VFD OPERATION CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W22	Product code :	11431289
		Catalog # :	20036ET3G447TS-W22

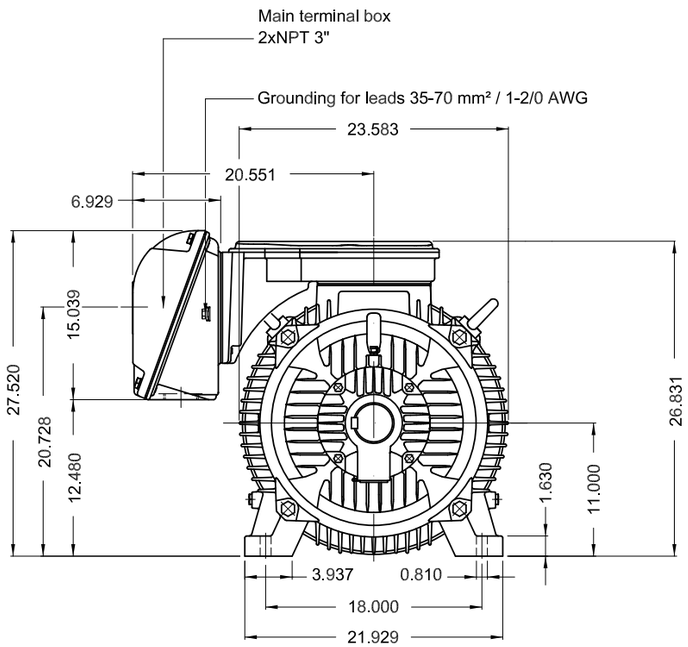


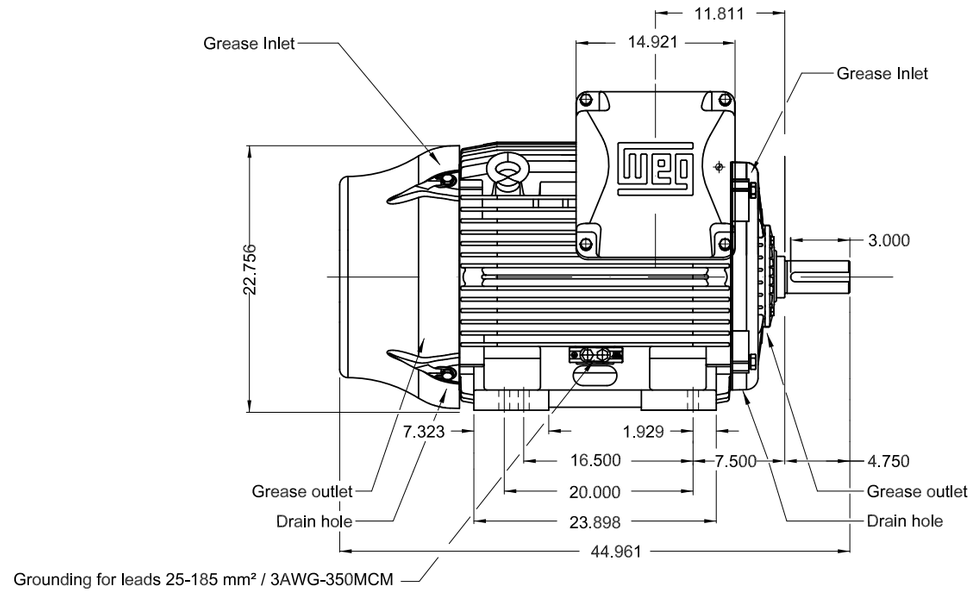
Performance	: 460 V 60 Hz 2P

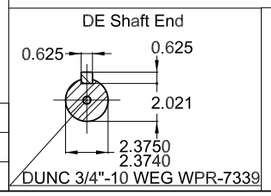
Rated current	: 219 A	Moment of inertia (J)	: 1.88 kgm²
LRC	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 40.7 kgfm	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	: 1.15
Breakdown torque	: 229 %	Temperature rise	: 80 K
Rated speed	: 3570 rpm	Design	: B

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	03/02/2023		5 / 5	







Color RAL 5009

Painting plan 203A

Mounting B3R(D)

200 HP 02 Poles 60 Hz

A

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
			HYBRISUSER				00

EXECUTED	HYBRISUSER	THREE PH. MOTOR W22 NEMA PREM. EFF.	PREVIEW
CHECKED		FRAME 445/7TS IP55 TEFC	WDD 00
RELEASED			
REL. DATE		WMO Jaragua do Sul Product Engineering	SHEET 1 / 1

Dimensions in inches

XME A3

NEMA Premium W22

3PT9 LISTED C US
FOR SAFE AREA
Mod.TE1BFOXON
CC029A

C US Energy Verified

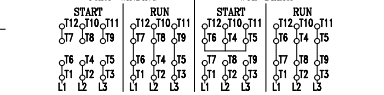
Class I, Div 2, Gr A, B, C and D – T3
Class I, Zone 2, IIC – T3
Class II, Div 2, Gr F and G – T3C
For use on PWM: Gr. A, B, C, D and F,
VT 1000:1, CT 20:1, 1.00SF – T3

MODEL 20036ET3G447TS-W22

MADE IN MEXICO
11431289

Inverter Duty Motor
Severe Duty

PH3 60Hz Fr. 445/7TS 1000m.a.s.l. IP55 TEFC 2045lb			
V 460		A 219	
HP 200		kW 150	
SF 1.15		SFA 252	
RPM 3570		PF 0.90	
AMB 40°C	INS cl. F DT80K	NEMA NOM EFF	95.4%
DUTY CONT.	DES B Code G		



→ 6314-C3 (27g)

→ 6314-C3 (27g)

MOBIL POLYREX EM (4000h)

HOFFMAN LAMSON
by Gardner Denver

Paint Finish
Centrifugal Products

DESCRIPTION

- VOC Compliant, Acrylic Polyurethane Paint with an Epoxy Primer
- 2-part, high building, high solid content, coating that provides a high gloss finish
- Excellent resistance to UV light, chemicals, corrosion, heat, and abrasion

TEST RESULTS

SALT SPRAY TESTING: Exceeds 2,000 hour requirements

CROSS HATCH:

- Scribe Undercutting: Less than 1 millimeter from scribe
- Blistering: Absent
- Rust staining: None

PROPERTIES

TOTAL SOLIDS (% by volume): 59-63 (primer)
69-73 (paint)

REDUCTION: None

VOC: 1.9 pounds per gallon

DRY APPLICATION
THICKNESS CAST PARTS: 2.0-4.0 mils (Primer)
: 3.0-5.0 mils (Top Coat)

DRY APPLICATION
THICKNESS STEEL PARTS: 3.0-5.0 mils

TEMPERATURE RESISTANCE: 200 °F continuous

ADHESION: ASTM D4541, 1200 PSI
PENCIL HARDNESS: ASTM D3363, 3H
IMPACT RESISTANCE: ASTM D2794, >140 Pounds
FLEXIBILITY: ASTM D522, 3/8 Inch Mandrel, 10.7%
WEATHERING: ASTM D4587, QUV-A, 3,000 Hours

SUMMARY

- Excellent chemical and wear resistance for virtually any blower application
- Virtually non-removable from a surface prepared using standard substrate cleaning practices
- Available in many colors at an additional charge provided a sample for custom matching is supplied

PRODUCT NOTES

1. Information is approximate, subject to change without notice, and not for construction use unless certified
2. Standard color is GDI Revolution Blue.

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
Phone: +1 800-982-3009 / +1 724-239-1500
Fax: +1 724-239-1502
E-mail: info.HoffmanLamson@gardnerdenver.com
Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

product data carboline®

Carboguard® 8922 LH

Selection & Specification Data

Generic Type Cross-linked epoxy

Description Carboguard 8922 LH is a versatile corrosion resistant coating. May be topcoated with itself, or a broad variety of high performance finish coats. Carboguard 8922 LH has surface tolerant properties. Specially formulated to meet current Federal guidelines for HAPS content.

Features
- Ready to apply after mixing; no sweat-in time or thinning required
- Economical fit for use epoxy
- Used as a primer or intermediate coat
- Can be applied over power tool cleaned surfaces
- Wet on wet application at 75° F (24°C) substrate temperature
- Acceptable over iron phosphate preparation
- Low HAPS of 1.85 pounds/solid gallon

Color Primer color (0700) gray

Finish Satin

Dry Film Thickness 2.0 - 4.0 mils (51 - 102 microns) per coat

Solids Content By Volume 61% +/- 2%

Theoretical Coverage Rate
978 ft^2 at 1 mil (24 m^2/l at 25 microns)
489 ft^2 at 2 mils (12 m^2/l at 50 microns)
245 ft^2 at 4 mils (6 m^2/l at 100 microns)

Allow for loss in mixing and application.

VOC Values As Supplied 2.79 lbs./gal 334 g/l

Thinned: 12 oz/gal w/ #72: 3.21 lbs/gal (384 g/l)
These are nominal values and may vary slightly with color.

Dry Temp. Resistance
Continuous: 200 °F (93 °C)
Non-Continuous: 250 °F (121 °C)

Discoloration and loss of gloss is observed above 200 F (93 C).

Limitations Epoxies lose gloss, discolor and eventually chalk in sunlight exposure. Not recommended for immersion service.

Topcoats May be coated with Acrylics, Epoxies, Alkyds, or Polyurethanes depending on exposure and need.

Substrates & Surface Preparation

General Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.

Steel Also acceptable over SSPC-SP2 and over blasted steel (SSPC-SP6) with a low 1-2 mil blast profile.

Phospatized Steel For most applications: apply 8922 LH directly to dry, properly phosphatized substrate. Perform adhesion tests to ensure proper, uniform and acceptable adhesion direct to the phosphatized metal substrate.

Performance Data

Test Method	System	Results
Adhesion (ASTM D4541)	Carboguard 8922 LH @1.9 mils	1200 psi average (cohesive failure)
Elongation/Flexibility (ASTM D522)	Carboguard 8922 LH @3.3 mils	Conical Mandrel: 3/8" diameter; 10.7% Elongation
Salt Fog (ASTM B117)	Carboguard 8922 LH / Carbothane 134 HG over Grit blasted steel	1500 hours: Plane, #8/6 Few blisters; Scribe, #6 Few blisters, Rust in scribe
Salt Fog (ASTM B117)	Carboguard 8922 LH / Carbothane 134 HG over Phosphatized steel	500 hours; Plane, No Effect; Scribe, Rust in Scribe only

Mixing & Thinning

Mixing Power mix separately, then combine and power mix. DO NOT MIX PARTIAL KITS.

Thinning Normally not required but may thin as follows:
Spray: Up to 12 oz/gal (10%) w/ #72.
Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.

Ratio 1:1 Ratio (A to B)

Pot Life 3 Hours at 75°F (24°C)
Pot life ends when coating loses body and begins to sag. Pot life times will be less at higher temperatures.

Application Equipment Guidelines

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

Spray Application (General) The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional Spray Pressure pot equipped with dual regulators, 3/8" I.D. minimum material hose, .070" I.D. fluid tip and appropriate air cap.

Airless Spray
Pump Ratio: 30:1 (min.)*
GPM Output: 2.5 (min.)
Material Hose: 3/8" I.D. (min.)
Tip Size: .015"-.019"
Output PSI: 2100-2300
Filter Size: 60 mesh
*Teflon packings are recommended and available from the pump manufacturer.

Brush & Roller (General) Multiple coats may be required to obtain desired appearance, recommended dry film thickness and adequate hiding. Avoid excessive re-brushing or re-rolling. For best results, tie-in within 10 minutes at 75°F (24°C).

Brush Use a medium bristle brush.

Roller Use a short-nap synthetic roller cover with phenolic core.

Carboguard® 8922 LH

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Minimum	50 °F (10 °C)	50 °F (10 °C)	50 °F (10 °C)	0%
Maximum	90 °F (32 °C)	125 °F (52 °C)	110 °F (43 °C)	80%

This product simply requires the substrate temperature to be above the dew point. Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Special application techniques may be required above or below normal application conditions.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Dry to Handle	Dry to Recoat	Maximum Recoat Time
50 °F (10 °C)	12 Hours	30.0 Minutes	1.0 Years
60 °F (16 °C)	6 Hours	10.0 Minutes	1.0 Years
75 °F (24 °C)	3 Hours	5.0 Minutes	1.0 Years
90 °F (32 °C)	2 Hours	3.0 Minutes	1.0 Years

These times are based on a 1.5-2.0 mil (37.5-50 micron) dry film thickness for non-immersion. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure. Excessive humidity or condensation on the surface during curing can interfere with the cure, can cause discoloration and may result in a surface haze. Any haze or blush must be removed by water washing before recoating. If the maximum recoat times have been exceeded, the surface must be abraded by sweep blasting or sanding prior to the application of additional coats. For force curing, contact Carboline Technical Service for specific requirements.

Cleanup & Safety

Cleanup Use #2 Thinner or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved respirator.

Caution This product contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workers should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

Packaging, Handling & Storage

Shelf Life Part A & B: Min. 24 months at 75°F (24°C)

*Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.

Shipping Weight (Approximate) 2 Gallon Kit - 26 lbs. (12 kg)
10 Gallon Kit - 127 lbs. (58 kg)

Storage Temperature & Humidity 40° - 110°F (4°- 43°C)
0-100% Relative Humidity

Packaging, Handling & Storage

Flash Point (Setaflash) Part A: 74°F (23°C)
Part B: 70°F (21°C)

carboline®
Coatings - Linings - Fireproofing
2150 Schuetz Rd., St. Louis, MO 63146
PH: 314-644-1000 Toll-Free: 800-848-4645
www.carboline.com

An RPM Company

December 2011
8927

carboline®

Carbothane® 8845

OEM ENGINEERED FINISHES product data

Selection & Specification Data

Generic Type
Two component, acrylic, aliphatic polyurethane.

Description
Carbothane 8845 is a fast dry, high solids, low VOC, high gloss, high build, two component polyurethane coating. Carbothane 8845 exhibits the excellent dry times and handling characteristics required by Original Equipment Manufacturers. This coating has outstanding hardness, adhesion and resistance to: impact, marring, abrasion, chemicals and staining. Carbothane 8845 is recommended as a direct to metal finish coat or as a finish coat over properly primed substrates. Typical applications include air compressors, propane tanks, trailer chassis and frames, valves, pumps, waste water treatment plant equipment, agricultural equipment, hazardous material storage buildings and general industrial equipment. Not recommended for continuous immersion service.

Features
- VOC compliant – 1.9 lbs/ gal as supplied
- Direct-To-Metal (DTM)
- Fast Dry – 7-8 hours to handle at 75°F
- High solids, high build, high gloss
- Excellent abrasion resistance
- Application by conventional, airless spray, HVLP or electrostatic
- Excellent chemical resistance
- Ambient air or force cure with conventional or infrared ovens

Color
Wide variety of custom colors

Finish
High Gloss

Primers
Self-priming, epoxy, zinc rich epoxy or as recommended by Carboline

Dry Film Thickness
3 – 5 mils per coat (75-125 microns).

Solids Content
By Volume: 71% ± 2%

Theoretical Coverage Rate per Gallon
379 ft^2 at 3 mils (75 microns)
284 ft^2 at 4 mils (100 microns)
227 ft^2 at 5 mils (125 microns)
Mixing and application losses will vary and must be taken into consideration when estimating job requirements.

HAPS Value
0.54 lbs/solid gallon

VOC Values
As supplied: 1.9 lbs/gal (228 g/l)
Thinned:
6 oz/gal w/ #76: 2.1 lbs/gal (252 g/l)
These are nominal values.

Ratio By Volume
4:1 Ratio
4 parts Carbothane 8845 Part A
1 part Carbothane 8843 Converter Part B

Pot Life
90 min at 75°F (24°C) unthinned
Pot life decreases at higher temperatures. Pot life ends when coating becomes too viscous to use. This product is moisture sensitive. Avoid moisture contamination.

Dry Temp. Resistance
Continuous: 200°F (93°C)
Non-Continuous: 250°F (121°C)
Discoloration is observed above 180°F (82°C).

Substrates & Surface Preparation

General
Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.

Steel
Abrasive blast to a commercial finish in accordance with SSPC-SP6 and obtain a 1½ - 2 mil (35-50 micron) blast profile.

Phosphatize
Apply 8845 directly to dry, properly phosphatized substrate. Perform adhesion tests to insure proper, uniform and acceptable adhesion of 8845 direct to phosphatized metal substrate.

Primed Surfaces
Remove any oil or grease from the surface to be coated with Thinner #2 or Carboline Surface Cleaner #3 (Refer to Data Sheet) in accordance with SSPC-SP1.

Typical Chemical Resistance

Exposure	Splash & Spillage	Fumes
Acids	Very Good[1]	Excellent
Alkalies	Very Good[1]	Excellent
Solvents	Very Good[2]	Excellent
Salt	Excellent	Excellent
Water	Excellent	Excellent

1. Certain colors may discolor.
2. Resistance may vary dependent on the type of solvent involved.

Curing Schedule

Ambient, Material & Surface Temp	Dry to Touch	Dry to Handle or Assemble	Dry to Full Cure
75°F (24°C)	90-120 minutes	7-8 hours	7-14 days

These times are based on a 4.0 mil (100 micron) dry film thickness. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure. Note: Product may be force cured.

FORCE CURE INFORMATION

Oven Temperature at 150°F (66°C)		
Flash Time is 20 minutes.	Oven Dwell Time 45 minutes.	Cool Down is 10 minutes.
Oven Temperature at 180°F (82°C)		
Flash Time is 20 minutes.	Oven Dwell Time 30 minutes.	Cool Down is 10 minutes.

Carbothane® 8845

Carboline 8000 Series has been specifically designed for OEM applications.

For specific product requirements or process painting recommendations contact Carboline OEM Engineered Finishes Division.

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

General Guidelines:

Spray Application (General) The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional Spray Pressure pot equipped with dual regulators, 3/8" I.D. minimum material hose, .070" I.D. fluid tip and appropriate air cap.

Airless Spray

Pump Ratio:	30:1 (min.)
GPM Output:	3.0 (min.)
Material Hose:	3/8" I.D. (min.)
Tip Size:	.013-.017"
Output PSI:	2500-3500
Filter Size:	60 mesh

Teflon packings are recommended and available from the pump manufacturer.

Electrostatic Contact Carboline for specific equipment recommendations.

HVLP Contact Carboline for specific equipment recommendations.

Touch Up Respray or brush. Brushing recommended only for touchup of small areas. Use natural bristle brush applying with full strokes.

Mixing & Thinning

Mixing For plural component application equipment follow the equipment manufacturer's instructions. For batch mixing, power mix part A separately, then combine and power mix thoroughly in the following proportions:
THIS PRODUCT IS MOISTURE SENSITIVE. AVOID MOISTURE CONTAMINATION. DO NOT MIX PARTIAL KITS.

Ratio 4:1 Ratio (A to B)

	1 Gallon Kit	5 Gallon Kit
8845 Part A	.8 gallons (in 1 gallon can)	4 gallons (in 5 gallon can)
Urethane Converter 8843	25.6 fluid ozs.	1 gallon

Thinning Normally not required. May be thinned up to 6 oz/gal (5%) with #76. Thinner #97, #214, or #215 may be used when applying 8845 in very hot conditions or longer working time is required. Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.

Pot Life 90 minutes at 75°F (24°C).

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-85°F (16°-29°C)	60°-85°F (16°-29°C)	60°-85°F (16°-29°C)	40-60%
Minimum	50°F (10°C)	35°F (2°C)	35°F (2°C)	10%
Maximum	130°F (54°C)	120°F (50°C)	95°F (35°C)	80%

Industry standards are for substrate temperatures to be 5°F (3°C) above the dew point.

Application Conditions Cont.

Caution: This product is moisture sensitive in the liquid stage and until fully cured. Protect from high humidity, dew and direct moisture contact until fully cured. Application and/or curing in humidities above maximum, or exposure to moisture from rain or dew may result in loss of gloss and/or microbubbling of the product.

Cleanup & Safety

Cleanup Use Thinner #2 or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved supplied air respirator.

Caution This product contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

Packaging, Handling & Storage

Shipping Weight 8845 (Approximate)	1 Gallon Kit	5 Gallon Kit
	15 lbs. (6 kg)	58 lbs. (22 kg)
Thinner 76	8 lbs. (4 kg)	41 lbs. (19kg)
Thinner 97	8 lbs. (4 kg)	41 lbs. (19kg)

Carbothane 8845 is also available in drum quantities.

Flash Point (Setaflash)

Part A:	63°F (17°C)
Part B:	62°F (17°C)
Thinner 76:	21°F (-6°C)

Storage (General) Store Indoors.

Storage Temperature & Humidity 40° - 110°F (4-43°C)
0-80% Relative Humidity

Shelf Life Part A: Min. 36 months at 75°F (24°C)
Part B: Min. 24 months at 75°F (24°C)

***Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.**

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314/644-1000 314/644-4617 (fax) www.carboline.com
An RPM Company

September 2014

HOFFMAN LAMSON

Accessories

Isolation Base Pads

Centrifugal Products

PERFORMANCE SPECIFICATIONS

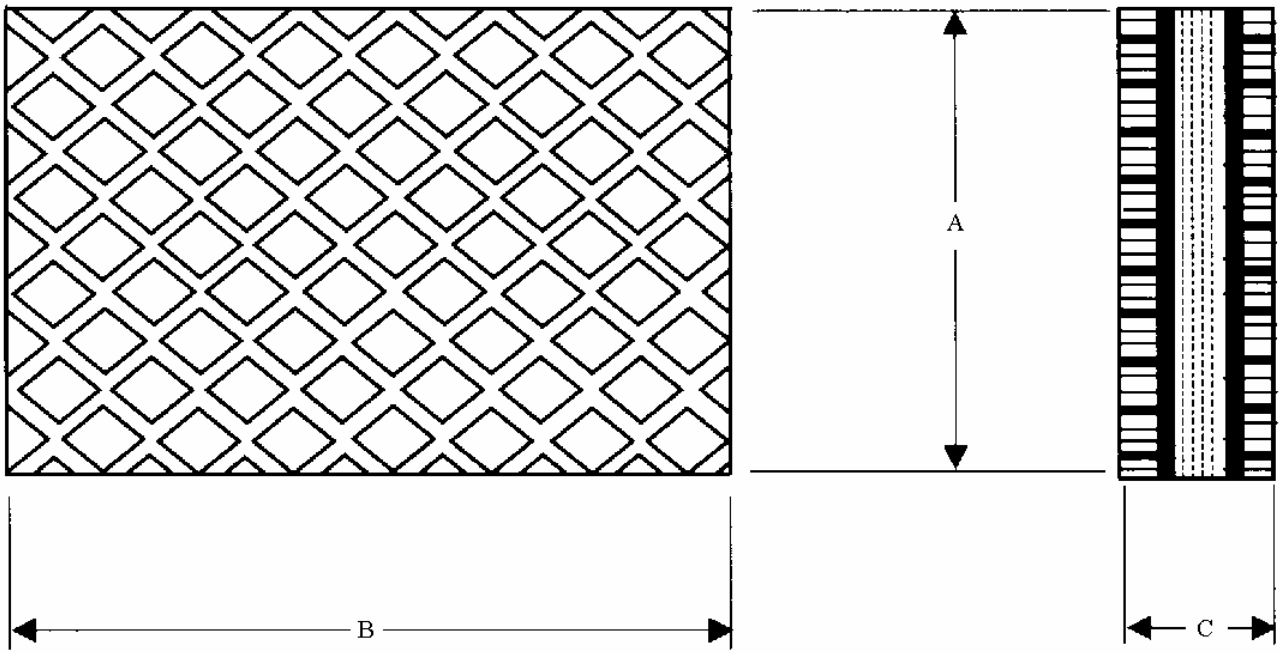
TEMP. RANGE: -20° F to 180° F (-28° C to 82° C)

LOAD RATING: 50 lbs-force / in^2 (3.5 kgs-force / cm^2)

MATERIALS OF CONSTRUCTION

ELASTOMER: ASTM D2000 Neoprene

CORK: MC-2 11# cork permanently bonded between 2 layers of waffle-tread design elastomer



PART NO.	A (in)	A (cm)	B (in)	B (cm)	C (in)	C (cm)	Area (in^2)	Area (cm^2)	Max. Load/Pad (lbs-force)	Max. Load/Pad (kgs-force)
HF00896814	3.0	7.6	3.0	7.6	1.0	2.5	9.00	58	450	203
HF20007590	2.0	5.0	8.0	20	1.0	2.5	16.00	103	800	362
HF10771055	6.0	15	8.0	20	1.0	2.5	48.00	309	2400	1087
VP1003583	1.5	3.8	1.5	3.8	1.0	2.5	2.25	14	113	51
VP1003005	4.0	10	4.0	10	1.0	2.5	16.00	103	800	362
VP1003074	6.0	15	6.0	15	1.0	2.5	36.00	232	1800	815
VP1003778	8.0	20	8.0	20	1.0	2.5	64.00	412	3200	1450

PRODUCT NOTES

1. Information is approximate, subject to change without notice, and not for construction use unless certified

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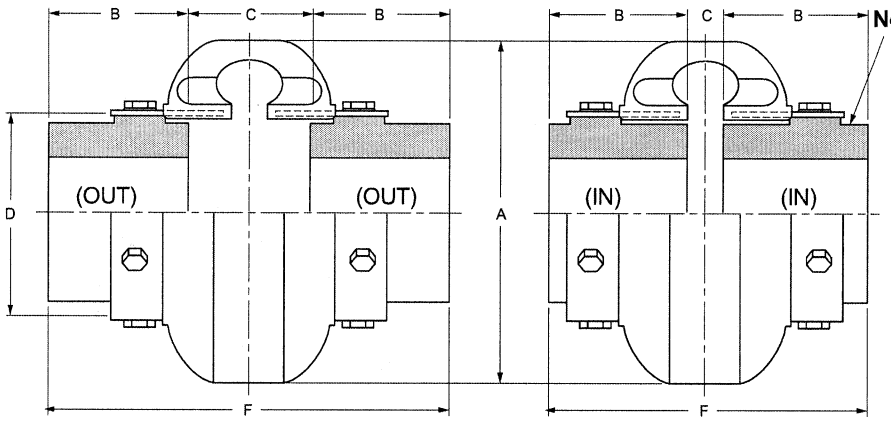
Web: www.**Hoffman**and**Lamson**.com

"Over 150 Years of Leadership"

REXNORD® OMEGA® STANDARD COUPLINGS

WITH STRAIGHT BORE HUBS



Note: Hub/shoulder design varies per coupling size. Consult Rexnord for specific size assembly drawings.

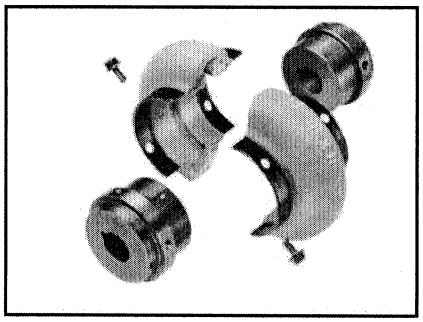
(HUBS OUTBOARD) (HUBS INBOARD))

Specification Data With Straight Bore Hubs

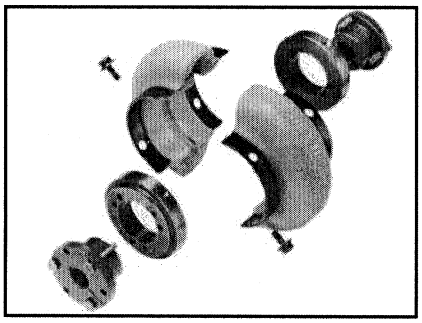
Omega Coupling Size	Recom. Max. Bore (In.)	① Continuous HP/100 RPM	① Continuous Torque (In. Lbs.)	Max. RPM	Dimensions In Inches							② Weight (Lb.)
					A	B	C (In.)	C (Out)	D	F (In.)	F (Out)	
E2	1.13	.30	190	7500	3.50	.94	1.34	1.90	1.85	3.22	3.78	1.2
E3	1.38	.58	365	7500	4.00	1.50	.81	1.31	2.32	3.81	4.31	2.4
E4	1.63	.88	550	7500	4.56	1.69	.44	1.31	2.60	3.81	4.69	3.0
E5	1.88	1.48	925	7500	5.38	1.75	.81	1.81	3.13	4.31	5.31	5.4
E10	2.13	2.30	1450	7500	6.38	1.88	.56	1.81	3.65	4.31	5.56	8.2
E20	2.38	3.65	2300	6600	7.25	2.06	.50	2.38	4.48	4.62	6.50	13.0
E30	2.88	5.79	3650	5800	8.25	2.31	.56	2.44	5.42	5.19	7.06	21.2
E40	3.38	8.85	5500	5000	9.50	2.50	.56	2.68	6.63	5.56	7.68	35
E50	3.63	12.14	7650	4200	11.00	2.75	.63	3.38	8.13	6.13	8.88	54
E60	4.00	19.84	12,500	3800	12.50	3.25	.69	3.44	8.75	7.19	9.94	72
E70	4.50	35.12	22,125	3600	14.00	3.62	.75	3.75	9.25	8.00	11.00	86
E80	6.00	62.70	39,500	2000	16.00	4.87	.75	5.00	11.25	10.50	14.75	170
E100	6.75	135	85,050	1900	21.00	5.50	1.75	3.75	14.13	12.75	14.75	244
E120	7.50	270	170,100	1800	25.00	6.00	2.25	4.88	17.63	14.24	16.88	425
E140	11.00	540	340,200	1500	30.00	7.00	3.00	5.00	20.88	17.00	19.00	746

① Service factor = 1.0
② With maximum bore hubs.

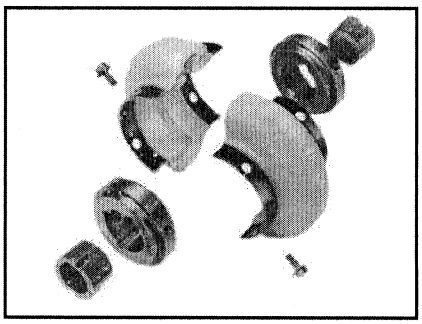
- **SPLIT-IN-HALF FLEX ELEMENT**
  Allows disassembly and replacement without disturbing hubs or connected equipment.
- **REVERSIBLE HUBS**
  Accommodates different shaft spacing requirements, and allows compression bushings to be installed from either side of the hub.



Straight Bore Hubs



QD Hubs and Bushings



TAPER-LOCK® Hubs and Bushings

Note: Dimensions subject to change. Certified dimensions of ordered material furnished on request.

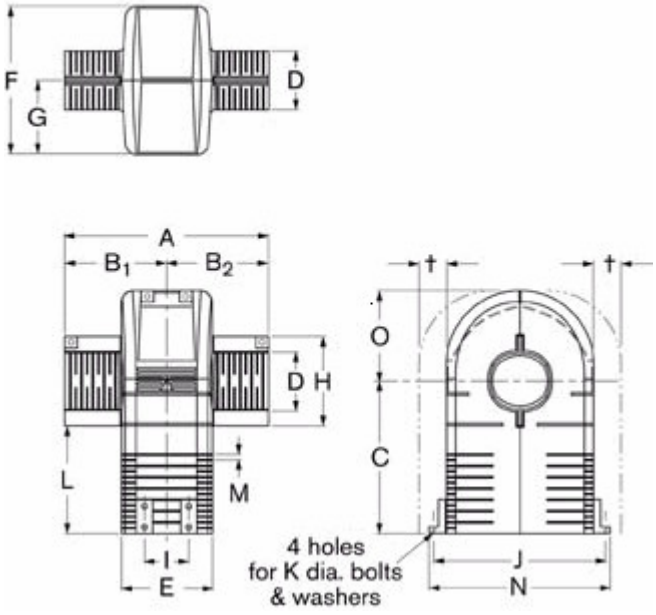
TITLE: GUARD-COUPLING

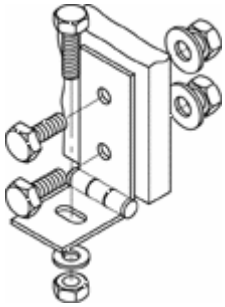
VENDOR: REXNORD - FALK

TYPE: ORANGE PEEL CCG

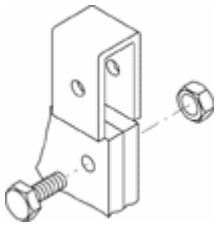
GENERAL: HDPE PLASTIC, A2/304 FASTENERS, GUARDS ARE HINGED, AND "PEEL" OPEN FOR CONVENIENT COUPLING LUBRICATION, INSPECTION, MAINTENANCE. IN ADDITION, GUARDS ASSURE COMPLIANCE WITH OSHA, ASME, AND ANSI STANDARDS.

Guard





Hinge Detail



Clip Detail

Notes:

- Extension clips are not required for B_1/B_2 minimum condition.
- Nominal material thickness is .13 in. (3.3mm) size 10, .19 in. (4.8mm) size 20/30, .250 in. (6.4mm) size 40/50.

† Requires a minimum 1/2 shaft dia. clearance in each direction for guard removal or installation.

GUARD DIMENSIONS -- INCHES

Gardner Denver Part No.	Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
51M2	20	12.00	6.00	11.00	4.00	5.50	9.50	4.75	6.00	1.25	11.15	0.25	8.00	0.50	12.00	5.75	12.25	6.13	4.50	11.25	6.00
51M3	30	18.00	9.00	13.50	5.00	8.00	13.25	6.63	8.00	3.88	15.50	0.31	9.50	0.50	16.75	8.00	18.00	9.00	6.50	16.50	7.00
51M4	40	23.00	11.50	16.50	6.00	10.50	17.00	8.50	9.00	6.00	19.25	0.31	12.00	0.50	20.50	10.00	21.50	12.00	9.00	20.00	8.00
51M5	50	27.00	13.50	19.50	7.50	13.25	21.00	10.50	10.50	7.38	23.25	0.31	14.25	0.50	24.50	12.00	26.50	14.50	10.00	24.50	9.00

SPECIFICATIONS

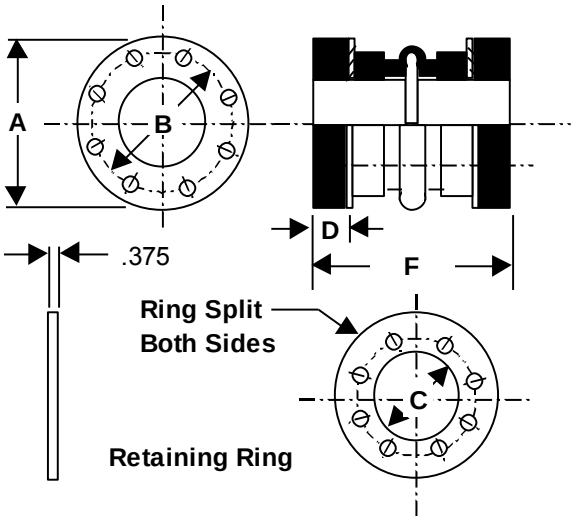
TEMPERATURE: 300° F
VACUUM: 16" Hg
FLANGE FIT: 125# (iron)
150# (steel)
ANSI drilling

PRESSURE:
3" – 12": 150 PSIG
14": 135 PSIG
16" – 20": 110 PSIG
24": 104 PSIG

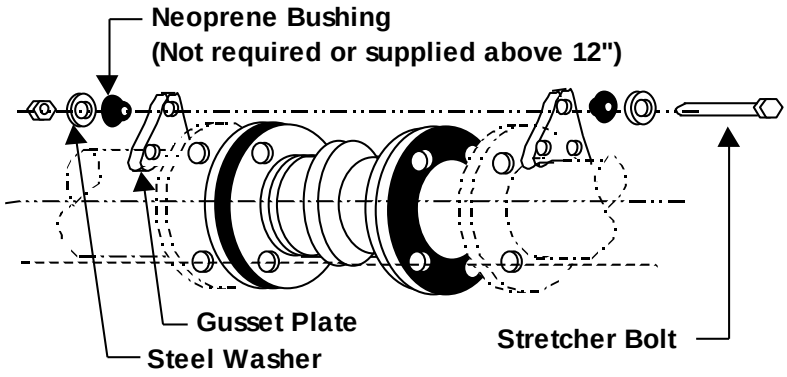
MATERIALS OF CONSTRUCTION

- Polyester Reinforced EPDM
- Cast Ductile Iron Retaining Rings (Galvanized)
- Galvanized Control Units

DIMENSIONAL DATA – Without Control Units



DIMENSIONAL DATA – With Control Units



Nominal Size I.D.	Part Number W/o C.U.	Part Number W / C.U.	A	B	C	D	F	# Bolt Holes	Weight W/o C.U.	Weight W / C.U.
3	HF00485044	HF00485074	7.50	6.00	4.13	0.44	6.00	4	8.50	17.00
4	HF00485045	HF00485075	9.00	7.50	5.13	0.44	6.00	8	10.00	18.00
5	HF00485046	HF00485076	10.00	8.50	6.13	0.44	6.00	8	12.50	21.00
6	HF00485047	HF00485077	11.00	9.50	7.13	0.44	6.00	8	16.50	26.00
8	HF00485048	HF00485078	13.50	11.75	9.25	0.50	6.00	8	22.00	35.00
10	HF00485049	HF00485079	16.00	14.25	11.25	0.50	8.00	12	34.00	53.00
12	HF00485050	HF00485080	19.00	17.00	13.38	0.50	8.00	12	45.00	65.00
14	HF00485051	HF00485081	21.00	18.75	15.50	0.56	8.00	12	55.00	82.00
16	HF00485059	HF00485082	23.50	21.25	17.50	0.56	8.00	16	64.00	91.00
18	HF00485060	HF00485083	25.00	22.75	19.63	0.63	8.00	16	71.00	100.00
20	HF00485052	HF00485084	27.50	25.00	21.63	0.63	8.00	20	82.00	111.00
24	HF00485061	HF00485085	32.00	29.50	25.88	0.75	10.00	20	102.00	148.00
30	HF00896822	HF00896821	38.75	36.00	31.50	0.75	10.00	28	150.00	213.00

PRODUCT NOTES

1. Specifications subject to change without notice
2. All dimensions are in inches and weights in pounds

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E-mail: info.HoffmanLamson@gardnerdenver.com
Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

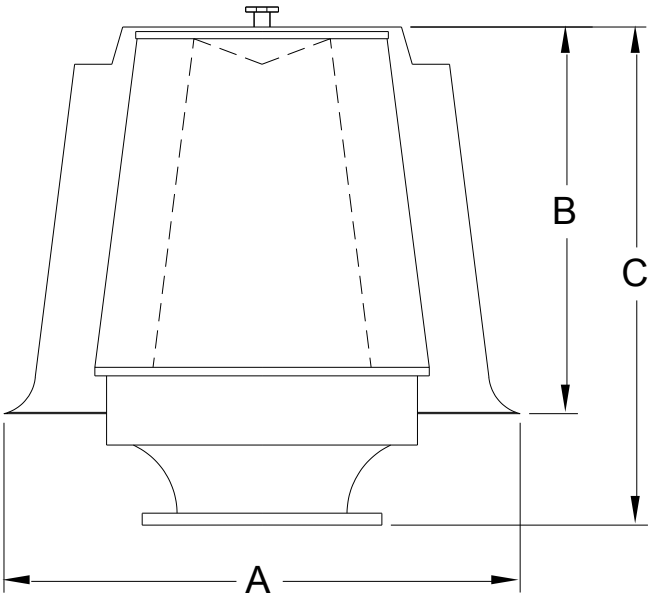
HOFFMAN LAMSON

Accessories

Intake Filter Silencers - Cartridge

Centrifugal Products

DIMENSIONAL DATA



SPECIFICATIONS

FLANGE FIT: ASME 125# (iron) and 150# (steel) ANSI drilling

ELEMENT EFFCY: Ultra: 99.97% efficiency @ 1-micron nom.
Hi-Flow: 98% efficiency @ 10-micron nom.

NOISE ATTENUATION: Octave Band Center Freq (Hz)

Hz	63	125	250	500	1000	2000	4000	8000
Attenuation (dB)	9	14	17	19	21	19	17	15

MATERIALS OF CONSTRUCTION

HOUSING: Carbon Steel, 10 Ga. LID: 3" – 8": Carbon Steel, 10 Ga.

FINISH: Polyester Powder Coat 10" – 18": ASTM B209 Aluminum, .125 Ga.

STANDARD 1/8 INCH TAP & PLUG TO MOUNT DIFFERENTIAL GAUGE

ELEMENT CORE: Expanded Flattened Galv. Steel, 24 Ga.

ELEMENT END CAP: Galv. Steel, 22 Ga.

ELEMENT MEDIA: Proprietary Synthetic Formulation

CONN. SIZE	P/N WITH ULTRA	CFM FLOW ULTRA	P/N WITH HI-FLOW	CFM FLOW HI-FLOW	A	B	C	WEIGHT	P/N ULTRA ELEMENT	P/N HI-FLOW ELEMENT
5" FLG	VP1012702	1100	VP1012710	1300	16.50	8.00	17.50	28	VP1011566	VP1012698
6" FLG	VP1009813	1350	VP1012711	1620	16.50	8.00	17.50	30	VP1011566	VP1012698
6" FLG	VP1011082	2000	VP1012712	2400	25.25	11.25	21.25	49	VP1012694	VP1008206
6" FLG	VP1010621	2250	VP1012714	2700	25.25	15.50	24.25	53	VP1012695	VP1012699
8" FLG	VP1012447	2500	VP1012715	3000	25.25	11.25	21.25	56	VP1012694	VP1008206
8" FLG	VP1012703	2900	VP1012716	3450	25.25	15.50	24.25	60	VP1012695	VP1012699
8" FLG	VP1010679	3300	VP1012717	4000	27.25	20.00	29.00	58	VP1012696	VP1012700
10" FLG	VP1012704	3750	VP1012718	4500	25.25	11.25	21.25	57	VP1012694	VP1008206
10" FLG	VP1012705	4000	VP1012719	4800	25.25	15.50	24.25	61	VP1012695	VP1012699
10" FLG	VP1010680	4250	VP1012579	5100	27.25	20.00	29.00	58	VP1012696	VP1012700
12" FLG	VP1010782	5150	VP1012720	6200	25.25	15.50	24.25	61	VP1012695	VP1012699
12" FLG	VP1011062	6100	VP1011044	7300	27.25	20.00	29.00	62	VP1012696	VP1012700
12" FLG	VP1012706	8250	VP1012721	9900	38.00	26.00	34.50	72	VP1012697	VP1012701
14" FLG	VP1012707	10000	VP1012722	12000	38.00	26.00	34.50	97	VP1012697	VP1012701
16" FLG	VP1012708	11000	VP1012723	13200	38.00	26.00	34.50	107	VP1012697	VP1012701
18" FLG	VP1012709	12000	VP1012724	14400	38.00	26.00	34.50	117	VP1012697	VP1012701

PRODUCT NOTES

1. Information is approximate, subject to change without notice, and not for construction use unless certified
2. Flow is at three inches water column pressure drop
3. All dimensions are in inches and weights in pounds

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
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Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

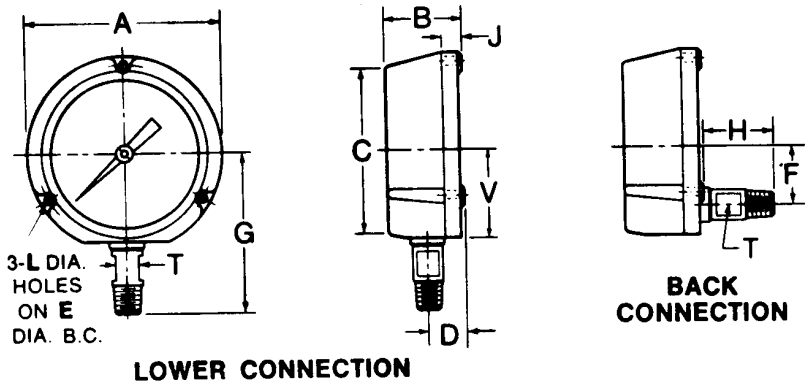
TITLE: PRESSURE GAUGE

GENERAL: This specification covers pressure gauges for general service

MATERIAL: Phenolic Case w/ stainless steel snap ring
Phosphor bronze Bourdon tube with brass tip and socket

VENDOR: Ashcroft Series 1220A

CASE TYPE 1220



Case Type 1220

Dial Size Inches	A	B	C	D	E	F	G ¼ NPT	G ½ NPT	H	J	L	T	V	Weigh. (lbs.)
4½	5 13/16 (148)	2 5/16 (59)	5 1/16 (129)	1 (25)	5 3/8 (137)	1 5/8 (41)	3 15/16 (100)	3 15/16 (100)	1½ (38)	9/16 (14)	.218 (5.5)	5/8 (16)	2 5/8 (67)	2½
6	7 5/8 (194)	2 3/8 (60)	6 5/8 (168)	1 1/16 (27)	7 (178)	2 1/8 (54)	4½ (114)	4½ (114)	1 7/16 (37)	5/8 (16)	.281 (7)	5/8 (16)	3½ (89)	3⅛
8½	10¼ (260)	2 3/8 (60)	9 (229)	1 1/16 (27)	9 5/8 (244)	2 1/8 (54)	6 (152)	6 (152)	1 7/16 (37)	5/8 (16)	.281 (7)	5/8 (16)	4 11/16 (119)	4½

GARDNER DENVER PART NUMBER

GAUGE SIZE	DIAL RANGE PSI	1/4" NPT BK. CONNECTION	1/4" NPT BTM CONNECTION	1/2" NPT BK. CONNECTION	1/2" NPT BTM CONNECTION
4-1/2	0/15		27P379		27P333
4-1/2	0/100kPA				27P378
4-1/2	0/100		27P381		27P378

I. General Maintenance Instructions During Extended Storage

A. Storage Area

All bare and base mounted blowers must be stored in a clean, dry, heated, (if possible) warehouse. The storage area must be free of ambient or transient vibration.

B. Motor Maintenance

Refer to the motor instruction manual for instructions on periodic check required and for specific instructions.

C. Blower Maintenance

When ordered for "Extended Storage" per System A (Bare Blower) or B (Accessories), the blower internal surfaces are protected by the insertion of the vapor phase inhibitors in the compression chamber. Every six months, one protective flange cover should be removed to inspect internal surfaces of the machine. Renew vapor phase inhibitors if evidence of rust is visible. Inspect exterior surfaces and coat with a rust-inhibitor primer where necessary.

Rotate the blower shaft at least once per week during storage. Inspect the blower shaft (near the shaft seal area) monthly and spray with rust-inhibitor if needed.

II. Instructions for the removal of products used for "Extended Storage" protection

A. Capsules

All protective flange covers and pipe plugs should be removed. Remove capsules which are attached either to the cover or immediately inside the cover.

B. Spray Rust Preventive

Removal not required.

III. Products used for "Extended Storage" and required renewal quantities

A. Products Used	Manufacturer
VPI Capsule	28H14
Rust Preventive	Dow Corning

PRODUCT NOTES

Specifications subject to change without notice.

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
Phone: +1 800-982-3009 / +1 724-239-1500
Fax: +1 724-239-1502
E-mail: info.HoffmanLamson@gardnerdenver.com
Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

TremPro® 644 RTV

General Purpose Silicone Sealant

Product Description

TremPro® 644 RTV is a one-part, general purpose, acetoxy silicone sealant.

Basic Uses

TremPro 644 RTV is specially designed for sealant joints between most non-porous materials such as glass, aluminum, metal and metal alloys. Industrial and residential uses include HVAC, plumbing and kitchen/bath fixtures. TremPro 644 RTV may also be used on site where a gun-grade sealant is required.

Features and Benefits

- Easily gunnable over a wide range of temperatures and has excellent adhesion to most common substrates without the use of a primer.
- TremPro 644 RTV skins within 30 min at 75 °F (24 °C) and 50% RH, and cures into a tough, durable, weather resistant material.
- It has excellent handling characteristics and tools to a smooth, attractive finish.
- TremPro 644's superior skin time makes it ideal for OEM and production line uses.
- Versions of TremPro 644 RTV containing fungicide for sanitary applications are available.

Packaging

10.1-oz (300-mL) cartridges

Colors

Clear, White, Dark Bronze, Almond, Black and Aluminum.

Availability

Immediately available from your local Tremco Field Representative, Tremco Distributor or Tremco Warehouse.

Limitations

- Do not apply over damp or contaminated surfaces.
- Use with adequate ventilation.
- Do not use on surfaces sensitive to corrosion by acetic acid vapors (a by-product of sealant cure).

Substrate Preparation

For good adhesion, the joint surface must be sound, clean and dry. Depending on the substrate, the joint surface may require a thorough wire brushing with a steel wool or Scotch Brite pad and/or solvent wipe.

Application

Cartridges of TremPro 644 RTV silicone are easy to apply with conventional caulking equipment. Fill joint completely and tool.

Damaged sealant can be repaired. Consult Tremco Technical Services or your local Tremco Sales Representative for repair procedures.

Clean Up

Tooling is recommended immediately after application to ensure firm, intimate contact with the joint interface. Dry tooling is preferred. Excess sealant and smears adjacent to the joint can be removed with IPA or MEK before sealant cures.

Warranty

Tremco warrants its Products to be free of defects in materials, but makes no warranty as to appearance or color. Since methods of application and on-site conditions are beyond our control and can affect performance, Tremco makes no other warranty, expressed or implied including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, with respect to Tremco Products. Tremco's sole obligation shall be, at its option, to replace, or refund the purchase price of the quantity of Tremco Products proven to be defective and Tremco shall not be liable for any loss or damage.

Please refer to our website at www.tremcosealants.com for the most up-to-date Product Data Sheets.

TYPICAL PHYSICAL PROPERTIES

PROPERTY	TEST METHOD	TYPICAL VALUES
100% Modulus		50 to 80 psi
Cure Time (1/8" thickness)		24 hr
Sag Resistance		0 to 0.4 mm
Service Temperature		-40 to 400 ˚F (-40 to 204 ˚C)
Shore A Hardness	ASTM C661	17 to 21
Tack Free Time		30 min
Tensile Strength		200 to 250 psi

0815/TPRO644RTVDS-ST

Please refer to our website at www.tremcosealants.com for the most up-to-date Product Data Sheets.

Tremco Commercial Sealants & Waterproofing

3735 Green Rd
Beachwood OH 44122
216.292.5000 / 800.321.7906

1451 Jacobson Ave
Ashland OH 44805
419.289.2050 / 800.321.6357

220 Wicksteed Ave
Toronto ON M4H1G7
416.421.3300 / 800.363.3213

1445 Rue de Coulomb
Boucherville QC J4B 7L8
514.521.9555

www.tremcosealants.com

SAFETY DATA SHEET

1. Identification

Material name: TREMPRO 644 RTV WHITE 3" - 12 CTG CS
Material: 6445065F312

Recommended use and restriction on use

Recommended use: Sealant
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor Information

Tremco U.S Sealants
3735 Green Road
Beachwood OH 44122
US

Contact person:	EH&S Department
Telephone:	216-292-5000
Emergency telephone number:	1-800-424-9300 (US); 1-613-996-6666 (Canada)

2. Hazard(s) identification

Hazard Classification

Health Hazards

Acute toxicity (Dermal)	Category 4
Acute toxicity (Inhalation - dust and mist)	Category 4
Carcinogenicity	Category 1A

Unknown toxicity - Health

Acute toxicity, oral	76.08 %
Acute toxicity, dermal	80.48 %
Acute toxicity, inhalation, vapor	100 %
Acute toxicity, inhalation, dust or mist	92.5 %

Environmental Hazards

Acute hazards to the aquatic environment	Category 3
Chronic hazards to the aquatic environment	Category 3

Unknown toxicity - Environment

Acute hazards to the aquatic environment	86.08 %
Chronic hazards to the aquatic environment	86.08 %

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: Harmful in contact with skin or if inhaled.
May cause cancer.
Harmful to aquatic life with long lasting effects.

Precautionary Statements

Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid breathing dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. Use personal protective equipment as required.

Response: IF ON SKIN: Wash with plenty of soap and water. Wash contaminated clothing before reuse. Call a POISON CENTER or doctor/ physician if you feel unwell. Specific measures (see supplemental first aid instructions on this label). IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF exposed or concerned: Get medical advice/attention.

Storage: Store locked up.

Disposal: Dispose of contents/ container to an approved facility in accordance with local, regional, national and international regulations.

Hazard(s) not otherwise classified (HNOC): None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	CAS number	Content in percent (%)*
Distillates, petroleum, hydrotreated middle	64742-46-7	5 - <10%
Silicon dioxide, amorphous	112945-52-5	5 - <10%
Ethyltriacetoxysilane	17689-77-9	1 - <5%
Acetic acid	64-19-7	1 - <3%
Titanium dioxide	1317-80-2	0.1 - <1%

Titanium dioxide	13463-67-7	0.1 - <1%
Octhilione	26530-20-1	0.01 - <0.1%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

Description of necessary first-aid measures

Inhalation: Move to fresh air.

Skin Contact: Wash skin thoroughly with soap and water. Call a POISON CENTER/doctor if you feel unwell.

Eye contact: Remove contact lenses, if present and easy to do. Continue rinsing. Rinse cautiously with water for several minutes. If eye irritation persists: Get medical advice/attention.

Ingestion: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.

Personal Protection for First-aid Responders: Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Most important symptoms/effects, acute and delayed

Symptoms: May cause skin and eye irritation.

Hazards: No data available.

Indication of immediate medical attention and special treatment needed

Treatment: Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical: During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: No data available.

Special protective equipment for fire-fighters: Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away.

Accidental release measures: In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

Methods and material for containment and cleaning up: Collect spillage in containers, seal securely and deliver for disposal according to local regulations.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid release to the environment.

7. Handling and storage

Handling

Technical measures (e.g. Local and general ventilation): Mechanical ventilation or local exhaust ventilation may be required. Observe good industrial hygiene practices. Observe occupational exposure limits and minimize the risk of inhalation of dust.

Safe handling advice: Ventilate well, avoid breathing vapors. Use approved respirator if air contamination is above accepted level. Use mechanical ventilation in case of handling which causes formation of dust.Avoid contact with eyes, skin, and clothing. Wash hands thoroughly after handling. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Use personal protective equipment as required.

Contact avoidance measures: No data available.

Hygiene measures: Avoid contact with skin. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product.

Storage

Safe storage conditions: Store locked up.

Safe packaging materials: No data available.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source
Distillates, petroleum, hydrotreated middle - Inhalable fraction.	TWA	5 mg/m3	US. ACGIH Threshold Limit Values, as amended (03 2014)
Distillates, petroleum, hydrotreated middle - Mist.	PEL	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended (02 2006)
Silicon dioxide, amorphous	TWA	20 millions of particles per	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (2000)

		cubic foot of air	
	TWA	0.8 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (2000)
Acetic acid	TWA	10 ppm	US. ACGIH Threshold Limit Values, as amended (2011)
	STEL	15 ppm	US. ACGIH Threshold Limit Values, as amended (2011)
	PEL	10 ppm 25 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended (02 2006)
Titanium dioxide	TWA	10 mg/m3	US. ACGIH Threshold Limit Values, as amended (2011)
Titanium dioxide - Total dust.	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended (02 2006)
Titanium dioxide - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (09 2016)
Titanium dioxide - Total dust.	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (09 2016)
Titanium dioxide - Inhalable particles.	TWA	10 mg/m3	US. ACGIH Threshold Limit Values, as amended (01 2021)
Titanium dioxide - Respirable particles.	TWA	3 mg/m3	US. ACGIH Threshold Limit Values, as amended (01 2021)
Titanium dioxide - Respirable fraction.	PEL	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended (01 2017)
Titanium dioxide - Total dust.	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended (01 2017)
Titanium dioxide - Respirable fraction.	TWA	5 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (09 2016)
Titanium dioxide - Total dust.	TWA	15 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (09 2016)
Titanium dioxide	TWA	10 mg/m3	US. ACGIH Threshold Limit Values, as amended (2011)
Titanium dioxide - Total dust.	PEL	15 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended (02 2006)
Titanium dioxide - Respirable fraction.	TWA	15 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (03 2016)
Titanium dioxide - Total dust.	TWA	15 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (03 2016)
Titanium dioxide - Respirable fraction.	TWA	5 mg/m3	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (03 2016)
Titanium dioxide - Total dust.	TWA	50 millions of particles per cubic foot of air	US. OSHA Table Z-3 (29 CFR 1910.1000), as amended (03 2016)

Chemical name	Type	Exposure Limit Values	Source
Distillates, petroleum, hydrotreated middle - Mist.	TWA	1 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (05 2013)
Distillates, petroleum, hydrotreated middle - Inhalable fraction.	TWA	5 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)
Distillates, petroleum, hydrotreated middle - Mist.	STEL	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	TWA	5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	TWA	0.2 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (06 2020)
Titanium dioxide - Total dust.	TWA	10 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Titanium dioxide - Respirable fraction.	TWA	3 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Titanium dioxide	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
Titanium dioxide - Total dust.	TWA	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)

Chemical name	Type	Exposure Limit Values	Source
Amorphous silica - Total	TWA	4 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Amorphous silica - Respirable.	TWA	1.5 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Amorphous silica - Respirable dust.	TWA	6 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Amorphous silica - Respirable fraction.	TWA	3 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (06 2020)
Amorphous silica - Inhalable fraction.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Amorphous silica - Respirable particles.	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Amorphous silica - Total dust.	TWA	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)
Amorphous silica - Respirable fraction.	TWA	3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Amorphous silica - Total dust.	TWA	10 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (06 2020)
Amorphous silica - Inhalable particles.	TWA	10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Distillates, petroleum, hydrotreated middle - Mist.	TWA	1 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (05 2013)
Distillates, petroleum, hydrotreated middle - Inhalable fraction.	TWA	5 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (06 2015)
Distillates, petroleum, hydrotreated middle - Mist.	STEL	10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	TWA	5 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	TWA	0.2 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (06 2020)
Acetic acid	STEL	15 ppm	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
	TWA	10 ppm	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Acetic acid	STEL	15 ppm	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	TWA	10 ppm	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)

Acetic acid	TWA	10 ppm	25 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	STEL	15 ppm	37 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
	TWA	10 ppm		Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)
Titanium dioxide - Total dust.	TWA		10 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Titanium dioxide - Respirable fraction.	TWA		3 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Titanium dioxide	TWA		10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
Titanium dioxide - Total dust.	TWA		10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)
Titanium dioxide - Total dust.	TWA		10 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (06 2020)
Titanium dioxide - Respirable fraction.	TWA		3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
	TWA		10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (03 2020)
Titanium dioxide - Inhalable particles.	TWA		10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Titanium dioxide - Inhalable fraction.	TWA		10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Titanium dioxide - Respirable particles.	TWA		3 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (01 2020)
Titanium dioxide - Respirable fraction.	TWA		3 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (06 2020)
Titanium dioxide - Total dust.	TWA		10 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Titanium dioxide - Respirable fraction.	TWA		3 mg/m3	Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Biological Substances, Occupational Health and Safety Regulation 296/97, as amended) (07 2007)
Titanium dioxide	TWA		10 mg/m3	Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents), as amended (11 2010)
	TWA		10 mg/m3	Canada. Quebec OELs. (Ministry of Labor - Regulation respecting occupational health and safety), as amended (09 2017)

Appropriate Engineering Controls

Mechanical ventilation or local exhaust ventilation may be required. Observe good industrial hygiene practices. Observe occupational exposure limits and minimize the risk of inhalation of dust.

Individual protection measures, such as personal protective equipment

Eye/face protection:	Wear safety glasses with side shields (or goggles).

Skin Protection

Hand Protection:	Additional Information: Use suitable protective gloves if risk of skin contact.
Skin and Body Protection:	Wear chemical-resistant gloves, footwear, and protective clothing appropriate for the risk of exposure. Contact health and safety professional or manufacturer for specific information.
Respiratory Protection:	In case of inadequate ventilation use suitable respirator. Seek advice from local supervisor.
Hygiene measures:	Avoid contact with skin. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product.

9. Physical and chemical properties

Appearance

Physical state:	solid
Form:	Paste
Color:	White
Odor:	Pungent
Odor threshold:	No data available.
pH:	No data available.
Melting point/freezing point:	No data available.
Initial boiling point and boiling range:	No data available.
Flash Point:	No data available.
Evaporation rate:	Slower than Ether
Flammability (solid, gas):	No
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper:	No data available.
Explosive limit - lower:	No data available.
Vapor pressure:	No data available.
Vapor density:	Vapors are heavier than air and may travel along the floor and in the bottom of containers.
Relative density:	1.01
Solubility(ies)	
Solubility in water:	Practically Insoluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity: No data available.

Chemical Stability: Material is stable under normal conditions.

Possibility of hazardous reactions: No data available.

Conditions to avoid: Avoid heat or contamination.

Incompatible Materials: Alcohols. Amines. Strong acids. Avoid contact with oxidizing agents (e.g. nitric acid, peroxides and chromates). Strong bases. Water, moisture.

Hazardous Decomposition Products: Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapors.

11. Toxicological information

Information on likely routes of exposure

Inhalation: In high concentrations, vapors, fumes or mists may irritate nose, throat and mucus membranes.

Skin Contact: Harmful in contact with skin. Causes mild skin irritation.

Eye contact: Eye contact is possible and should be avoided.

Ingestion: May be ingested by accident. Ingestion may cause irritation and malaise.

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation: No data available.

Skin Contact: No data available.

Eye contact: No data available.

Ingestion: No data available.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: ATEmix: 10,327.82 mg/kg

Dermal
Product: ATEmix: 1,835.61 mg/kg

Inhalation
Product: ATEmix: 1.72 mg/l

Repeated dose toxicity

Product: No data available.

Skin Corrosion/Irritation

Product: No data available.

Specified substance(s):

Distillates, petroleum, hydrotreated middle	in vivo (Rabbit): Irritating , 24 - 72 h
Ethyltriacetoxysilane	in vivo (Rabbit): Category 1B , 24 - 72 h
Acetic acid	in vivo (Rabbit): Slightly irritating , 72 h
Titanium dioxide	in vivo (Rabbit): Not irritant , 1 h
Titanium dioxide	in vivo (Rabbit): Not irritant , 24 h

Serious Eye Damage/Eye Irritation

Product: No data available.

Specified substance(s):

Distillates, petroleum, hydrotreated middle	Rabbit, 24 hrs: Not irritating
Ethyltriacetoxysilane	Rabbit, 24 - 72 hrs: Not irritating
Titanium dioxide	Rabbit, 24 hrs: Not irritating

Respiratory or Skin Sensitization

Product: No data available.

Carcinogenicity

Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:

Distillates, petroleum, hydrotreated middle	Overall evaluation: Not classifiable as to carcinogenicity to humans. Overall evaluation: Carcinogenic to humans.
Titanium dioxide	Overall evaluation: Possibly carcinogenic to humans.
Titanium dioxide	Overall evaluation: Possibly carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens:

Distillates, petroleum, hydrotreated middle	Known To Be Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050), as amended:

No carcinogenic components identified

Germ Cell Mutagenicity

In vitro

Product: No data available.

In vivo

Product: No data available.

Reproductive toxicity

Product: No data available.

Specific Target Organ Toxicity - Single Exposure

Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure

Product: No data available.

Aspiration Hazard

Product: No data available.

Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product:	No data available.
Specified substance(s):	
Distillates, petroleum, hydrotreated middle	LL 50 (Oncorhynchus mykiss, 96 h): 1.13 mg/l QSAR QSAR, Key study
Ethyltriacetoxysilane	LC 50 (Danio rerio, 96 h): 251 mg/l Experimental result, Key study
Acetic acid	LC 50 (Oncorhynchus mykiss, 96 h): > 1,000 mg/l Experimental result, Key study
Titanium dioxide	LC 50 (Pimephales promelas, 96 h): > 1,000 mg/l Read-across from supporting substance (structural analogue or surrogate), Weight of Evidence study EC 10 (Carassius auratus, 24 h): 10 mg/l Experimental result, Not specified
Titanium dioxide	LC 50 (Pimephales promelas, 96 h): 8.2 mg/l Read-across from supporting substance (structural analogue or surrogate), Supporting study
Octhilione	LC 50 (Oncorhynchus mykiss, 96 h): 0.047 mg/l

Aquatic Invertebrates

Product:	No data available.
Specified substance(s):	
Distillates, petroleum, hydrotreated middle	EC 50 (Daphnia magna, 48 h): 7.385 mg/l QSAR QSAR, Key study
Ethyltriacetoxysilane	EC 50 (Daphnia magna, 48 h): 65 mg/l Experimental result, Weight of Evidence study
Acetic acid	EC 50 (Daphnia magna, 48 h): 65,000 µg/l EC 50 (Daphnia magna, 48 h): > 1,000 mg/l Experimental result, Key study
Titanium dioxide	EC 50 (Daphnia magna, 48 h): > 1,000 mg/l Read-across from supporting substance (structural analogue or surrogate), Weight of Evidence study
Titanium dioxide	EC 50 (Water flea (Daphnia magna), 48 h): > 1,000 mg/l Intoxication

Chronic hazards to the aquatic environment:

Fish

Product:	No data available.
Specified substance(s):	
Distillates, petroleum, hydrotreated middle	NOAEL (Oncorhynchus mykiss): 0.069 mg/l QSAR QSAR, Key study

Aquatic Invertebrates

Product:	No data available.

Specified substance(s):

Distillates, petroleum, hydrotreated middle	NOAEL (Daphnia magna): 0.163 mg/l QSAR QSAR, Key study
Ethyltriacetoxysilane	NOAEL (Daphnia magna): >= 100 mg/l Read-across from supporting substance (structural analogue or surrogate), Key study
Acetic acid	NOAEL (Daphnia magna): 22.7 mg/l Experimental result, Not specified

Toxicity to Aquatic Plants

Product:	No data available.

Persistence and Degradability

Biodegradation

Product:	No data available.

Specified substance(s):

Distillates, petroleum, hydrotreated middle	41.96 % Detected in water. Experimental result, Key study
Ethyltriacetoxysilane	79.5 % (28 d) Detected in water. Experimental result, Key study 79.5 % (28 d) Detected in water. Read-across from supporting substance (structural analogue or surrogate), Key study
Acetic acid	96 % (20 d) Detected in water. Experimental result, Key study

BOD/COD Ratio

Product:	No data available.

Bioaccumulative potential

Bioconcentration Factor (BCF)

Product:	No data available.

Specified substance(s):

Acetic acid	Various, Aquatic sediment QSAR, Key study
Octhilione	Bluegill (Lepomis macrochirus), Bioconcentration Factor (BCF): 165 (Flow through)

Partition Coefficient n-octanol / water (log Kow)

Product:	No data available.

Specified substance(s):

Acetic acid	Log Kow: -0.17

Mobility in soil: No data available.

Other adverse effects: Harmful to aquatic life with long lasting effects.

13. Disposal considerations

Disposal methods: Dispose of waste at an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Contaminated Packaging: No data available.

14. Transport information

TDG:

Not Regulated

CFR / DOT:

Not Regulated

IMDG:

Not Regulated

Further Information:

The above shipping description may not be accurate for all container sizes and all modes of transportation. Please refer to Bill of Lading.

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

None present or none present in regulated quantities.

US. Toxic Substances Control Act (TSCA) Section 5(a)(2) Final Significant New Use Rules (SNURs) (40 CFR 721, Subpt E)

None present or none present in regulated quantities.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050), as amended

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
Acetic acid	5000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate (Acute) Health Hazards
Delayed (Chronic) Health Hazard

Acute toxicity (any route or exposure)
Carcinogenicity

US. EPCRA (SARA Title III) Section 304 Extremely Hazardous Substances Reporting Quantities and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substances

Not regulated.

US. EPCRA (SARA Title III Section 313 Toxic Chemical Release Inventory (TRI) Reporting

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65

WARNING
Cancer - www.P65Warnings.ca.gov

US. New Jersey Worker and Community Right-to-Know Act

Chemical Identity

Proprietary ingredients in Wacker Elastosil 5103P series (Codes 28939, 28940, 28961, 28962, 28963, 28964, 28965)
Amorphous silica
Distillates, petroleum, hydrotreated middle
Silicon dioxide, amorphous
Ethyltriacetoxysilane
Acetic acid
Titanium dioxide
Titanium dioxide
Octhilione

US. Massachusetts RTK - Substance List

Chemical Identity

Amorphous silica
Distillates, petroleum, hydrotreated middle
Silicon dioxide, amorphous
Acetic acid

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity

Amorphous silica
Distillates, petroleum, hydrotreated middle
Silicon dioxide, amorphous
Acetic acid

US. Rhode Island RTK

Chemical Identity
Amorphous silica
Distillates, petroleum, hydrotreated middle
Acetic acid

International regulations

Montreal protocol
Not applicable

Stockholm convention
Not applicable

Rotterdam convention
Not applicable

Kyoto protocol
Not applicable

VOC:

Regulatory VOC (less water and exempt solvent)	:	21 g/l
VOC Method 310	:	2.03 %

Inventory Status:

EINECS, ELINCS or NLP:	One or more components in this product are not listed on or exempt from the Inventory.
Japan (ENCS) List:	One or more components in this product are not listed on or exempt from the Inventory.
Canada NDSL Inventory:	One or more components in this product are not listed on or exempt from the Inventory.
US TSCA Inventory:	All components in this product are listed on or exempt from the Inventory.
Japan ISHL Listing:	One or more components in this product are not listed on or exempt from the Inventory.
Japan Pharmacopoeia Listing:	One or more components in this product are not listed on or exempt from the Inventory.
Mexico INSQ:	One or more components in this product are not listed on or exempt from the Inventory.
Ontario Inventory:	One or more components in this product are not listed on or exempt from the Inventory.
Taiwan Chemical Substance Inventory:	One or more components in this product are not listed on or exempt from the Inventory.
Australia Industrial Chem. Act (AIIC):	One or more components in this product are not listed on or exempt from the Inventory.
Canada DSL Inventory List:	All components in this product are listed on or exempt from the Inventory.
China Inv. Existing Chemical Substances:	One or more components in this product are not listed on or exempt from the Inventory.
Korea Existing Chemicals Inv. (KECI):	One or more components in this

	product are not listed on or exempt from the Inventory.
New Zealand Inventory of Chemicals:	One or more components in this product are not listed on or exempt from the Inventory.
Philippines PICCS:	One or more components in this product are not listed on or exempt from the Inventory.
Switzerland New Subs Notified/Registered:	One or more components in this product are not listed on or exempt from the Inventory.

16.Other information, including date of preparation or last revision

Revision Date:	01/27/2022
Version #:	2.2
Further Information:	No data available.
Disclaimer:	For Industrial Use Only. Keep out of Reach of Children. The hazard information herein is offered solely for the consideration of the user, subject to their own investigation of compliance with applicable regulations, including the safe use of the product under every foreseeable condition.

Safety Data Sheet

Company Identity: Gardner Denver Nash, LLC
Product Identity: AEON® Centrifugal Blower and Exhauster Bearing Lubricating Grease
SDS Date: 04/22/2015
Original: 04/22/2015

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements of the Global Harmonizing System.

THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

Product Identity: AEON® Centrifugal Blower and Exhauster Bearing Lubricating Grease
SYNONYMS: None
PRODUCT USES: Grease

COMPANY IDENTITY: GARDNER DENVER NASH, LLC
COMPANY ADDRESS: 200 SIMKO BLVD
COMPANY CITY: CHARLEROI, PA 15022
COMPANY PHONE: 1-724-239-1500
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: !-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

CAUTION

2.1 HAZARD STATEMENTS: (CAT = Hazard Category)
This product does not meet the Global Harmonizing System criteria for classification.
Hazard(s) not otherwise classified: Not Classified.
GHS PICTOGRAMS: Not Applicable
GHS SIGNAL WORD: Not Applicable
GHS HAZARD STATEMENTS: Not Applicable
GHS PRECAUTIONARY STATEMENTS: Not Applicable

2.2 PRECAUTIONARY STATEMENTS:
PREVENTION: Observe good industrial hygiene practices. Isolate from extreme heat & flame.
RESPONSE: Wash hands after handling.
STORAGE: Store away from incompatible materials.
DISPOSAL: Dispose of waste and residues in accordance with local authority requirements.

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Mineral Oil	Confidential		80-90
1H-Benzotriazole-1-Methanamine N,N-Bis(2-Ethylhexyl)-Methyl-Benzenamine, N-Phenyl-, Reaction Products with	94270-86-7		1- 5
2,4,4-Trimethylpentene	68411-46-1		1- 5
Zinc Dithiophosphate	68649-42-3		1- 2.5
Lithium Salt of Aliphatic Acid	Confidential		1- 5
Methylene Bis-(DibutylDithiocarbamate)	10254-57-6		1- 5
Lithium Hydroxide	1310-66-3		0.1- 1

The specific chemical component identities and/or the exact component percentages of this material may be withheld as trade secrets. This information is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of 29 CFR 1910.1200 (I)(1).

TRACE COMPONENTS: Trace ingredients (if any) are present in < 1% concentration,(< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute significant additional hazards at the concentrations that may be present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalents, and Canadian Hazardous Materials Identification System Standard (CPR 4).

SECTION 4. FIRST AID MEASURES

4.1 MOST IMPORTANT SYMPTOMS/EFFECTS, ACUTE & CHRONIC:
See Section 11 for Symptoms/Effects (acute & chronic).

4.2 EYE CONTACT:
For eyes, flush with plenty of water for 15 minutes & get medical attention.

4.3 SKIN CONTACT:
In case of contact with skin immediately remove contaminated clothing.
Wash thoroughly with soap & water. Wash contaminated clothing before reuse.

4.4 INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR).

4.5 SWALLOWING:
Rinse mouth. Give plenty of water to drink. Do NOT induce vomiting. GET MEDICAL ATTENTION IMMEDIATELY. Do NOT give liquids to an unconscious or convulsing person.

SECTION 5. FIRE FIGHTING MEASURES

5.1 FIRE & EXPLOSION PREVENTIVE MEASURES:
NO open flames.

5.2 SUITABLE (& UNSUITABLE) EXTINGUISHING MEDIA:
Use water fog, foam, dry chemical or carbon dioxide. Do not use straight streams of water.

5.3 SPECIAL PROTECTIVE EQUIPMENT & PRECAUTIONS FOR FIRE FIGHTERS:
Water spray may be ineffective on fire but can protect fire-fighters
& cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).

SECTION 5. FIRE FIGHTING MEASURES (CONTINUED)

5.4 SPECIFIC HAZARDS OF CHEMICAL & HAZARDOUS COMBUSTION PRODUCTS: SLIGHTLY COMBUSTIBLE!
Isolate from oxidizers, heat, & open flame.
Closed containers may explode if exposed to extreme heat.
Applying to hot surfaces requires special precautions.
Continue all label precautions!

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 SPILL AND LEAK RESPONSE AND ENVIRONMENTAL PRECAUTIONS:
Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. No action shall be taken involving personal risk without suitable training. Keep unnecessary and unprotected personnel from entering spill area. Do not touch or walk through material. Avoid breathing vapor or mist. Provide adequate ventilation. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel. ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area).

6.2 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT, EMERGENCY PROCEDURES:
The proper personal protective equipment for incidental releases (such as: 1 Liter of the product released in a well-ventilated area), use impermeable gloves, they should be Level B: **triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant Suit and boots, hard-hat, and Self-Contained Breathing Apparatus** specific for the material handled, goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard hat, and Self-Contained Breathing Apparatus or respirator.

Personal protective equipment are required wherever engineering controls are not adequate or conditions for potential exposure exist. Select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.

SECTION 6. ACCIDENTAL RELEASE MEASURES (CONTINUED)

6.3 ENVIRONMENTAL PRECAUTIONS:
Stop spill at source. Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material. Close or cap valves and/or block or plug hole in leaking container and transfer to another container. Keep from entering storm sewers and ditches which lead to waterways, and if necessary, call the local fire or police department for immediate emergency assistance.

6.4 METHODS AND MATERIAL FOR CONTAINMENT & CLEAN-UP:
Absorb spilled liquid with polypads or other suitable absorbent materials. If necessary, neutralize using suitable buffering material, (acid with soda ash or base with phosphoric acid), and test area with litmus paper to confirm neutralization. Clean up with non-combustible absorbent (such as: sand, soil, and so on). Shovel up and place all spill residue in suitable containers. dispose of at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal (see Section 13 - Disposal Considerations).

6.5 NOTIFICATION PROCEDURES:
In the event of a spill or accidental release, notify relevant authorities in accordance With all applicable regulations. US regulations require reporting release of this material To the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

SECTION 7. HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING:
Isolate from oxidizers, heat, & open flame. Use only with adequate ventilation. Avoid prolonged or repeated contact with skin. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse. Avoid free fall of solid. Ground containers when transferring. Do not flame cut, braze, or weld. Continue all label precautions! NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.

7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES:
Keep separated from strong acids, metals, food & feedstuffs. Keep dry. Do not store above 49 C/120 F. Keep container tightly closed & upright when not in use to prevent leakage.

7.3 NONBULK: CONTAINERS:
Store containers in a cool, dry location, away from direct sunlight, sources of intense Heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

7.4 BULK CONTAINERS:
All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

7.5 TANK CAR SHIPMENTS:
Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

7.6 PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:
Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Collect all rinsates and dispose of according to applicable Federal, State, Provincial, or local procedures.

7.7 EMPTY CONTAINER WARNING:
Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or

disposal through suitably qualified or licensed contractor and in accordance with governmental regulations.

DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY BURST AND CAUSE INJURY OR DEATH.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 EXPOSURE LIMITS:

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Mineral Oil	Confidential		None Known	None Known
1H-Benzotriazole-1-Methanamine, N,N-Bis(2-Ethylhexyl)-Methyl-Benzenamine, N-Phenyl-, Reaction Products with 2,4,4-Trimethylpentene	94270-86-7		None Known	None Known
Zinc Dithiophosphate	68649-42-3		None Known	None Known
Lithium Salt of Aliphatic Acid	Confidential		None Known	None Known
Methylene Bis-(DibutylDithiocarbamate)	10254-57-6		None Known	None Known
Lithium Hydroxide	1310-66-3		None Known	None Known

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

8.2 APPROPRIATE ENGINEERING CONTROLS:

RESPIRATORY EXPOSURE CONTROLS

Airborne concentrations should be kept to lowest levels possible. If vapor, dust or mist is generated and the occupational exposure limit of the product, or any component of the product, is exceeded, use appropriate NIOSH or MSHA approved air purifying or air-supplied respirator authorized in 29 CFR 1910.134, European Standard EN 149, or applicable State Regulations, after determining the airborne concentration of the contaminant. Air supplied respirators should always be worn when airborne concentration of the contaminant or oxygen content is unknown. Maintain airborne contaminant concentrations below exposure limits. If adequate ventilation is not available or there is potential for airborne exposure above the exposure limits, a respirator may be worn up to the respirator exposure limitations, check with respirator equipment manufacturer's recommendations/limitations. For particulates, a particulate respirator (NIOSH Type N95 or better filters) may be worn. If oil particles (such as: lubricants, cutting fluids, glycerine, and so on) are present, use a NIOSH Type R or P filter. For a higher level of protection, use positive pressure supplied air respiration protection or Self-Contained Breathing Apparatus or if oxygen levels are below 19.5% or are unknown.

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS

Positive pressure, full-face piece Self-Contained Breathing Apparatus; or positive pressure, full-face piece Self-Contained Breathing Apparatus with an auxiliary positive pressure Self-Contained Breathing Apparatus.

VENTILATION

LOCAL EXHAUST:	Necessary
MECHANICAL (GENERAL):	Necessary
SPECIAL:	None
OTHER:	None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

8.3 INDIVIDUAL PROTECTION MEASURES, SUCH AS PERSONAL PROTECTIVE EQUIPMENT:

EYE PROTECTION:

Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. If contact is possible, chemical splash goggles should be worn, when a higher degree of protection is necessary, use splash goggles or safety glasses. Face-shields are recommended when the operation can generate splashes, sprays or mists.

HAND PROTECTION:

Use gloves chemically resistant to this material. Glove must be inspected prior to use. Preferred examples: Butyl rubber, Chlorinated Polyethylene, Polyethylene, Ethyl vinyl alcohol laminate ("EVAL"), Polyvinyl alcohol ("PVA"). Examples of acceptable glove barrier materials include: Natural rubber ("latex"), Neoprene, Nitrile/butadiene rubber ("nitrile") or ("NBR"), Polyvinyl chloride ("PVC") or "vinyl"), Viton. Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be

different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good practices. Wash and dry hands.

BODY PROTECTION:
Use body protection appropriate for task. Cover-all, rubber aprons, or chemical protective clothing made from impervious materials are generally acceptable, depending on the task.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION (CONTINUED)

WORK & HYGIENIC PRACTICES:
Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using toilet facilities and at the end of the working period. Provide readily accessible eye wash stations & safety showers. Remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Solid, Red
ODOR:	None
ODOR THRESHOLD:	Not Available
pH (Neutrality):	Not Available
MELTING POINT/FREEZING POINT:	Not Available
BOILING RANGE (IBP,50%,Dry Point):	> 316 C / > 600 F
FLASH POINT (TEST METHOD):	> 204 C / > 400 F (PM)
EVAPORATION RATE (n-Butyl Acetate=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Class III-B
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	10.0 (Lowest Component)
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	< 0.013 kPa (0.1 mm Hg) @ 20 C
VAPOR DENSITY (air=1):	Not Applicable
GRAVITY @ 68/68F / 20/20C:	
DENSITY:	0.999
SPECIFIC GRAVITY (Water=1):	1.000
POUNDS/GALLON:	8.330
WATER SOLUBILITY:	Negligible
PARTITION COEFFICIENT (n-Octane/Water):	> 3.5 (Estimate)
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VISCOSITY @ 20 C (ASTM D445):	100 cSt @ 40 C / 104 F

* Using CARB (California Air Resources Board Rules).

SECTION 10. STABILITY & REACTIVITY

10.1 REACTIVITY & CHEMICAL STABILITY:
Stable under normal conditions, no hazardous reactions when kept from incompatibles.

10.2 POSSIBILITY OF HAZARDOUS REACTIONS & CONDITIONS TO AVOID:
Isolate from extreme heat, & open flame.

10.3 INCOMPATIBLE MATERIALS:
Isolate from strong oxidizers.

10.4 HAZARDOUS DECOMPOSITION PRODUCTS:
Carbon Oxides from burning.

10.5 HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 ACUTE HAZARDS

11.1.1 SKIN CONTACT: Primary irritation to skin, defatting, dermatitis.

11.1.2 EYE CONTACT: Primary irritation to eyes, redness, tearing, blurred vision. Solid can cause eye irritation.

11.1.3 INHALATION: Vapor harmful. The applicable occupational exposure limit value should not be exceeded during any part of the working exposure.

11.1.4 SWALLOWING: Swallowing can cause abdominal irritation, nausea, vomiting & diarrhea.

11.2 SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing disorders of any target organs mentioned in this Document can be aggravated by over-exposure by routes of entry to components of this product. Persons with these disorders should avoid use of this product.

11.3 CHRONIC HAZARDS
11.3.1 CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS: This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

SECTION 11. TOXICOLOGICAL INFORMATION (CONTINUED)

11.3.2 TARGET ORGANS: May cause damage to target organs, based on animal data.

11.3.3 IRRITANCY: Irritating to contaminated tissue.

11.3.4 SENSITIZATION: No component is known as a sensitizer.

11.3.5 MUTAGENICITY: No known reports of mutagenic effects in humans.

11.3.6 EMBRYOTOXICITY: No known reports of embryotoxic effects in humans.

11.3.7 TERATOGENICITY: No known reports of teratogenic effects in humans.

11.3.8 REPRODUCTIVE TOXICITY: No known reports of reproductive effects in humans.

A MUTAGEN is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate across generational lines. An EMBRYOTOXIN is a chemical which causes damage to a developing embryo (such as: within the first 8 weeks of pregnancy in humans), but the damage does not propagate across generational lines. A TERATOGEN is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A REPRODUCTIVE TOXIN is any substance which interferes in any way with the reproductive process.

11.4 MAMMALIAN TOXICITY INFORMATION: No mammalian information is available on this product.

SECTION 12. ECOLOGICAL INFORMATION

12.1 ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.2 EFFECT OF MATERIAL ON PLANTS AND ANIMALS:
This product may be harmful or fatal to plant and animal life if released Into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.

12.3 EFFECT OF MATERIAL ON AQUATIC LIFE: The substance may be hazardous in the environment. Special attention should be given to water organisms.

EL50 (72 hours):	> 1000 mg/L (Pseudokirchneriella subcapitata)
LL0 (96 hours):	1000 mg/L (Oncorhynchus mykiss)
EL0 (48 hours):	1000 mg/L (Daphnia magna)

12.4 MOBILITY IN SOIL
Mobility of this material has not been determined.

12.5 DEGRADABILITY
This product is completely biodegradable.

12.6 ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

THE GENERATION OF WASTE SHOULD BE AVOIDED OR MINIMIZED WHEREVER POSSIBLE.
Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers and liners may retain some product residues. Vapor from some product residues may create a highly flammable or explosive atmosphere inside the container.

DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE USED CONTAINERS TO HEAT, FLAME, SPARKS, STATICELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY BURST AND CAUSE INJURY OR DEATH.

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Processing, use or contamination may change the waste disposal requirements. Do not dispose of on land, in surface waters, or in storm drains. Waste should be recycled or disposed of in accordance with regulations. Large amounts should be collected for reuse or consigned to licensed hazardous waste haulers for disposal.

ALL DISPOSAL MUST BE IN ACCORDANCE WITH ALL FEDERAL, STATE, PROVINCIAL, AND LOCAL REGULATIONS. IF IN DOUBT, CONTACT PROPER AGENCIES.

SECTION 14. TRANSPORT INFORMATION

MARINE POLLUTANT:	No
DOT/TDG SHIP NAME:	Not Regulated
DRUM LABEL:	None
IATA / ICAO:	Not Regulated
IMO / IMDG:	Not Regulated
EMERGENCY RESPONSE GUIDEBOOK NUMBER:	None

SECTION 15. REGULATORY INFORMATION

15.1 EPA REGULATION: SARA SECTION 311/312 HAZARDS: None Known

All components of this product are on the TSCA list. This material contains no known products restricted under SARA Title III, Section 313 in amounts greater or equal to 1%.

Any release equal to or exceeding the RQ must be reported to the National Response Center (800-424-8802) and appropriate state and local regulatory agencies as described in 40 CFR 302.6 and 40 CFR 355.40 respectively. Failure to report may result in substantial civil and criminal penalties. State & local regulations may be more restrictive than federal regulations.

15.2 STATE REGULATIONS:

CALIFORNIA SAFE DRINKING WATER & TOXIC ENFORCEMENT ACT (PROPOSITION 65):
This product contains no chemicals known to the State of California to cause cancer or reproductive toxicity.

15.3 INTERNATIONAL REGULATIONS

The identified components of this product are listed on the chemical inventories of the following countries: Australia (AICS), Canada (DSL or NDSL), China (IECSC), Europe (EINECS, ELINCS), Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC), Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

15.4 CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

D2B: Irritating to skin / eyes.

This product was classified using the hazard criteria of the Controlled Products Regulations (CPR). This Document contains all information required by the CPR.

SECTION 16. OTHER INFORMATION

16.1 HAZARD RATINGS

HEALTH (NFPA): 0, HEALTH (HMIS): 0, FLAMMABILITY: 1, PHYSICAL HAZARD: 0
(Personal Protection Rating to be supplied by user based on use conditions.) This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

16.2 EMPLOYEE TRAINING

See Section 2 (Hazards Identification). Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

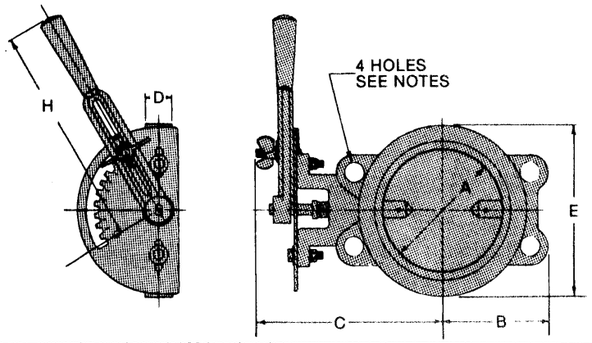
16.3 SDS DATE: 04/22/2015

Notice

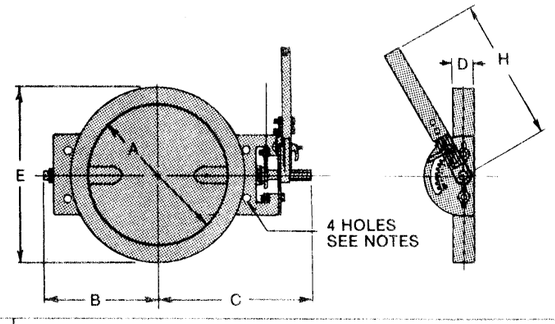
The supplier disclaims all expressed or implied warranties of merchantability or fitness for a specific use, with respect to the product or the information provided herein, except for conformation to contracted specifications. All information appearing herein is based upon data obtained from manufacturers and/or recognized technical sources. While the information is believed to be accurate, we make no representations as to its accuracy or sufficiency. Conditions of use are beyond our control, and therefore users are responsible for verifying the data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their handling, and disposal of the product. Users also assume all risks in regards to the publication or use of, or reliance upon information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or process.

Unless updated, the Safety Data Sheet is valid until 04/22/2018.

REV.	CHANGE DESCRIPTION	ECR/N	NAME/DATE	CHK'D	REL. DATE
0	RELEASE	60540	HDM 1-14-82	CAF	2/12/82
1	ADD ITEM 4 & 5, MOD ITEM 1 & 3, GEN'L REVS.	60672	[illegible]	CAF	5-10-84
A	SAP REV LEVEL UPDATE ONLY				
B	REPLACE 'TEFLON BRAIDED ASBESTOS' TEXT ON ITEM 4.	1038122	KMM 10/12/07		10/12/07



Assembly Part Number	Nominal Size	Dimensions A	B	C	D	E	F	G	H	Approx. Assembly Weight
BA-106103	3"	3.0 (76.2)	3.13 (79.5)	7.88 (200.2)	1.5 (38.1)	5.3 (134.6)	0.75 (19.1)	6.0 (152.4)	11.0 (279.4)	13.0 (5.9)
BA-106104	4"	4.0 (101.6)	4.25 (108.0)	8.38 (212.9)	1.5 (38.1)	6.25 (158.8)	0.75 (19.1)	7.5 (190.5)	11.0 (279.4)	14.0 (6.4)
BA-106105	5"	5.0 (127.0)	4.88 (124.0)	8.88 (225.6)	1.5 (38.1)	7.38 (187.5)	0.88 (22.4)	8.5 (215.9)	11.0 (279.4)	16.0 (7.3)
BA-106106	6"	6.0 (152.4)	5.38 (136.7)	9.38 (238.3)	1.5 (38.1)	8.56 (217.4)	0.88 (22.4)	9.5 (241.3)	11.0 (279.4)	18.0 (8.2)
BA-106108	8"	8.0 (203.2)	6.5 (165.1)	10.38 (263.7)	1.5 (38.1)	10.75 (273.1)	0.88 (22.4)	11.75 (298.5)	11.0 (279.4)	23.0 (10.4)
BA-106110	10"	10.0 (254.0)	8.0 (203.2)	12.65 (321.3)	1.88 (47.8)	13.0 (330.2)	1.0 (25.4)	14.25 (362.0)	11.0 (279.4)	42.0 (19.1)
BA-106112	12"	12.0 (304.8)	9.5 (241.3)	13.65 (346.7)	1.88 (47.8)	15.25 (387.4)	1.0 (25.4)	17.0 (431.8)	11.0 (279.4)	52.0 (23.6)
BA-106114	14"	13.13 (333.5)	11.38 (289.1)	15.13 (384.3)	1.88 (47.8)	17.5 (444.5)	1.13 (28.7)	18.75 (476.3)	17.0 (431.8)	72.0 (32.7)



Assembly Part Number	Nominal Size	Dimensions A	B	C	D	E	F	G	H	Approx. Assembly Weight
BA-106116	16"	15.25 (387.4)	12.75 (323.9)	18.38 (466.7)	2.38 (60.3)	20.0 (508.0)	1.13 (28.6)	21.25 (539.8)	17.0 (431.8)	149.0 (67.6)
BA-106118	18"	17.25 (438.2)	13.88 (352.4)	19.13 (485.8)	2.38 (60.3)	21.38 (542.9)	1.25 (31.8)	22.75 (577.9)	17.0 (431.8)	170.0 (77.1)
BA-106120	20"	19.25 (489.0)	14.88 (377.8)	20.25 (514.4)	2.38 (60.3)	23.63 (600.1)	1.25 (31.8)	25.0 (635.0)	17.0 (431.8)	189.0 (85.7)
BA-106124	24"	23.25 (590.6)	17.25 (438.2)	22.0 (558.8)	2.38 (60.3)	28.0 (711.2)	1.38 (34.9)	29.5 (749.3)	17.0 (431.8)	255.0 (115.7)

Notes:

1. The four "F" diameter holes on "G" diameter bolt circle match 125# — 150# standard flange drilling.
2. Standard valves are suitable for temperatures to 450° F.
3. Dimensions are in inches and (mm). Weights are in pounds and (kg).

4. **Materials of Construction**

Body.....Cast Iron
Disc .....Cast Iron
Shaft.....416 Stainless Steel
Seal.....Swing-thru
Bearing.....Graphited Bronze
Packing.....Graphited Teflon
Packing Nut.....Brass

5. **Vendor: Process Development & Control, Inc.**
Imperial, PA., or Engineering Approved Equal

QUANTITY	ITEM	PART NO.	DRAWING NO.	DESCRIPTION

DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED

NEXT ASSEMBLY	TOLERANCES: UNLESS OTHERWISE NOTED	SCALE: ~ IN. = ~ FT.	DATE
	NON-DECIMALS ± 1/16 DECIMALS	DRAWN [illegible]	1-14-82
	ANGLES ± 1° .00 ± .03	CHECKED [illegible]	2-12-82
	.000 ± .010	APPROVED	

BLOWERS & EXHAUSTERS

Butterfly Valve Assemblies Wafer Type, With Lever Actuators

SOURCE CONTROL

LAMSON

SYRACUSE, N.Y. 13221

BA1061

DRAWING NO. SH. OF

REV. B

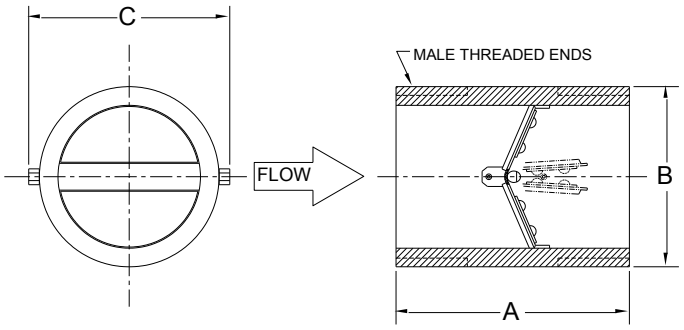
DWG. B SIZE

REF. PART / DWG. NO.:

SPECIFICATIONS

BODY: Cast Iron (Flanged & Wafer) 125#/150# Drilling
Carbon Steel (Threaded)
SEALING MEMBER: High Quality Silicone, 500° F Max. Rating
INTERNALS: Aluminum
DESIGN: Springless & Seatless
CWP THREADED: 150 PSI Rating
CWP FLANGED: 50 PSI (2"-14") & 125 PSI (16"-24") Rating
CWP WAFER: 125 PSI Rating

THREADED CHECK VALVE



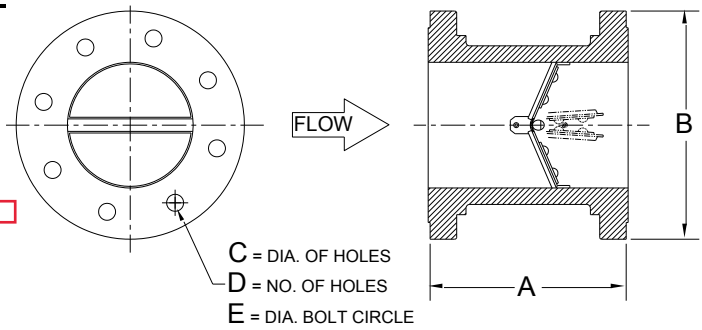
DIMENSIONAL DATA – Threaded Type

PART NO.	SIZE	A	B	C	WGT.
BA1006200000	2.0	4.00	2.38	2.81	2.0
BA1006210000	2.5	5.00	2.88	3.31	2.8
BA1006220000	3.0	5.50	3.50	4.12	4.5
BA1006230000	4.0	6.00	4.50	5.12	6.9
BA1006240000	5.0	7.00	5.56	6.19	11.0

DIMENSIONAL DATA – Flange Type (FF)

PART NO.	SIZE	A	B	C	D	E	WGT.
BA1006010000	2.0	4.50	6.00	0.75	4	4.75	12.5
BA1006020000	2.5	5.00	7.00	0.75	4	5.50	19.0
BA1006030000	3.0	5.00	7.50	0.75	4	6.00	22.0
BA1006040000	4.0	5.50	9.00	0.75	8	7.50	31.0
BA1006050000	5.0	6.00	10.00	0.88	8	8.50	37.0
BA1006060000	6.0	7.00	11.00	0.88	8	9.50	53.0
BA1006070000	8.0	9.00	13.50	0.88	8	11.75	86.0
BA1006080000	10.0	11.00	16.00	1.00	12	14.25	127.0
BA1006090000	12.0	13.00	19.00	1.00	12	17.00	210.0
BA1006100000	14.0	15.00	21.00	1.13	12	18.75	220.0
BA1006110000	16.0	17.00	23.50	1.13	16	21.25	375.0
BA1006120000	18.0	19.00	25.00	1.25	16	22.75	440.0
BA1006130000	20.0	21.00	27.50	1.25	20	25.00	525.0
BA1006140000	24.0	25.00	32.00	1.38	20	29.50	775.0

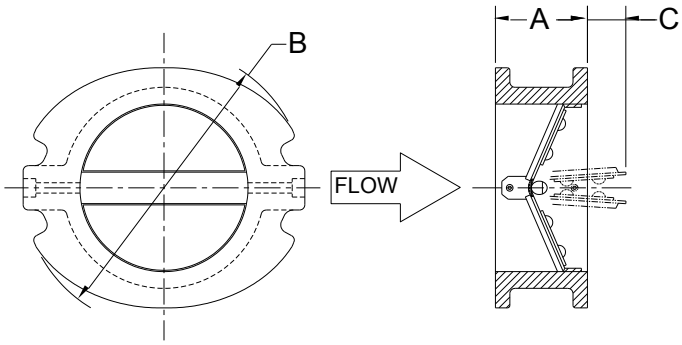
FLANGED CHECK VALVE



DIMENSIONAL DATA – Wafer Type

PART NO.	SIZE	A	B	C	WGT.
BA1006510000	2.0	1.38	4.25	0.50	4.0
BA1006520000	2.5	1.62	5.50	0.56	7.0
BA1006530000	3.0	1.88	6.00	0.69	10.0
BA1006540000	4.0	2.38	7.50	0.88	12.0
BA1006550000	5.0	2.88	9.00	1.13	15.0
BA1006560000	6.0	3.38	10.50	1.50	25.0
BA1006570000	8.0	4.38	13.00	2.25	45.0
BA1006580000	10.0	5.38	14.87	2.50	70.0
BA1006590000	12.0	6.38	17.50	3.00	120.0
BA1006600000	14.0	7.38	21.00	3.25	175.0
BA1006610000	16.0	8.38	23.50	3.75	220.0
BA1006620000	18.0	9.38	25.00	4.25	230.0
BA1006630000	20.0	10.38	27.50	4.75	320.0
BA1006640000	24.0	12.38	32.00	5.75	410.0

WAFER CHECK VALVE



PRODUCT NOTES

1. Information is approximate, subject to change without notice and not for construction use unless certified
2. All dimensions are in inches and weights in pounds

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
Phone: +1 800-982-3009 / +1 724-239-1500
Fax: +1 724-239-1502
E-mail: info.HoffmanLamson@gardnerdenver.com
Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

CONTROLS

HOFFMAN LAMSON CF SELECT plus

1260, 5 Stage(s) (5 x 1004) , 3550 RPM

Date: 2/3/2023

Project Name: City of Everett Backup Blower

Customer:

Sales Order Number: 5150126

Application Engineer: AAT

Comment:

AMBIENT GAS PARAMETERS	ENGLISH UNITS	METRIC UNITS
Molecular Weight	28.742 lbm/lbmol	28.742 kg/kgmol
R Value	53.755 ft.lbf/lbm.R	0.289 kJ/kg.K
Density	0.069 lbm/ft^3	1.104 kg/m^3
Sp. Heat @ Const. P	0.243 BTU/lbm.R	1.016 kJ/kg.K
Ratio of Sp. Heats	1.397	1.397
Partial Pres. of Vapor	0.287	0.287

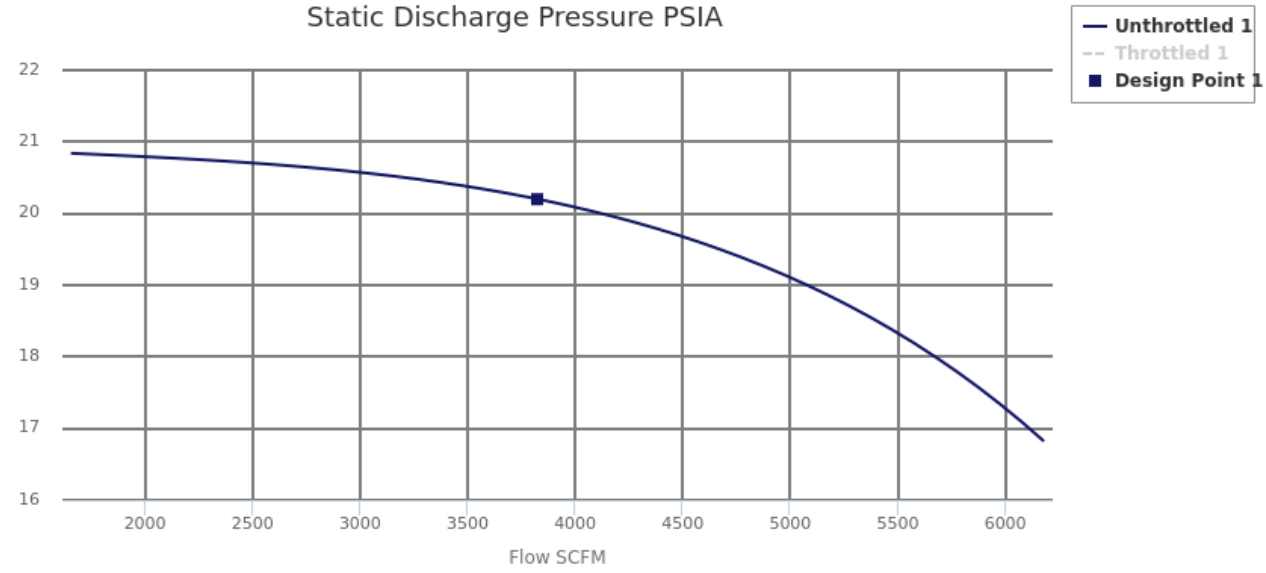
GAS MIX:	VOL
Air	100

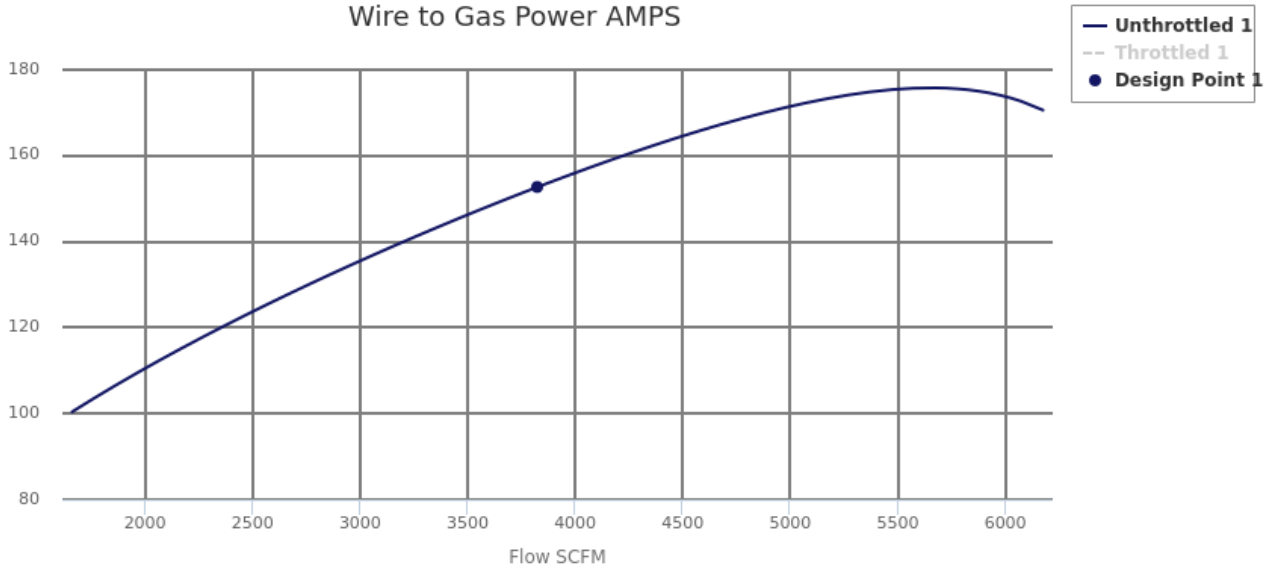
Inlet Set 1

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	14.40 PSIA	14.40 PSIA	0.99 bar a
Relative Humidity	30%	30%	30%
Ambient Temperature	100 F	100.00 F	37.78 C
Inlet Pressure	14.20 PSIA	14.20 PSIA	-13.79 mbar g
Inlet Flow	3825 SCFM	4249 ICFM	7219 m3/h
Discharge Pressure	5.8 PSIG	5.80 PSIG	0.40 bar g
MEASURED VALUES	**ORIGINAL UNITS**	**ENGLISH UNITS**	**METRIC UNITS**
Surge Flow Rate	1660 SCFM	1845 ICFM	3134 m3/h
Surge Pressure	6.44 PSIG	6.44 PSIG	0.44 bar g
Pressure Rise to Surge	0.64 PSIG	0.64 PSIG	0.04 bar g
Max. Vol. Turndown	56.59%	56.59%	56.59%
Pressure @ Design	5.80 PSIG	5.80 PSIG	0.40 bar g
Power @ Design	141.29 HP	141.29 HP	105.36 KW
Efficiency @ Design	68.93%	68.93%	68.93%
Temperature @ Design	185.56 F	185.56 F	85.31 C

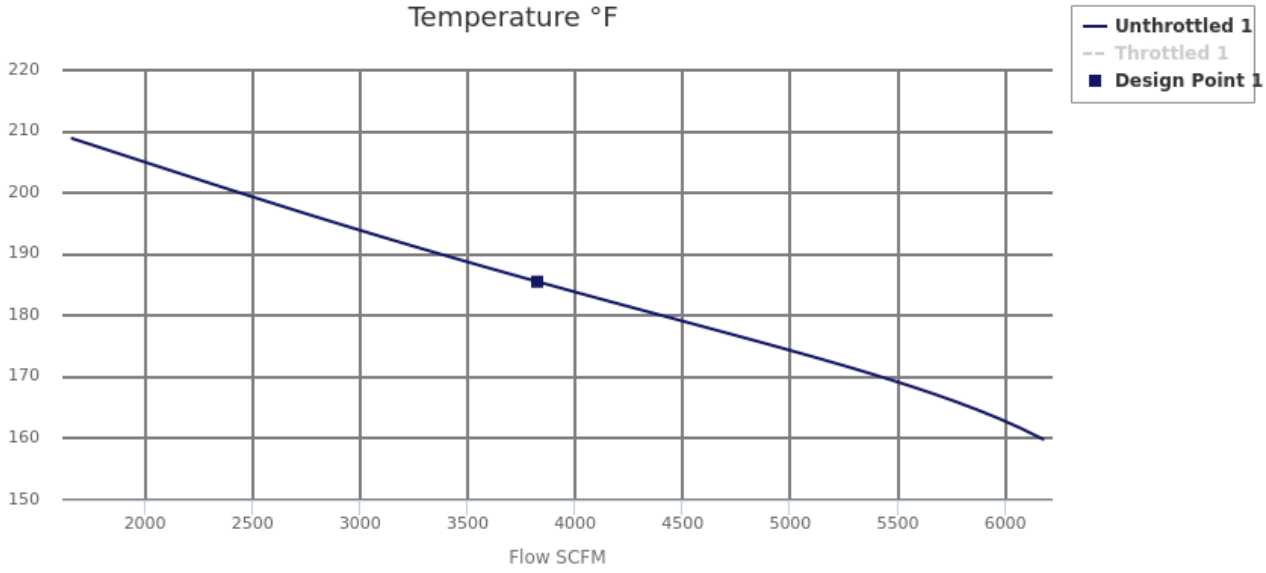
AMP CURVE VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Surge Flow Rate	1660 SCFM	1845 ICFM	3134 m3/h
Amps at Surge	100.42 Amps	100.42 Amps	72.01 KW
Design Flow Rate	3825 SCFM	4249 ICFM	7219 m3/h
Amps at Design	152.73 Amps	152.73 Amps	109.52 KW
Endpoint Flow Rate	6175 SCFM	6859 ICFM	11653 m3/h
Amps at Endpoint	170.60 Amps	170.60 Amps	122.33 KW

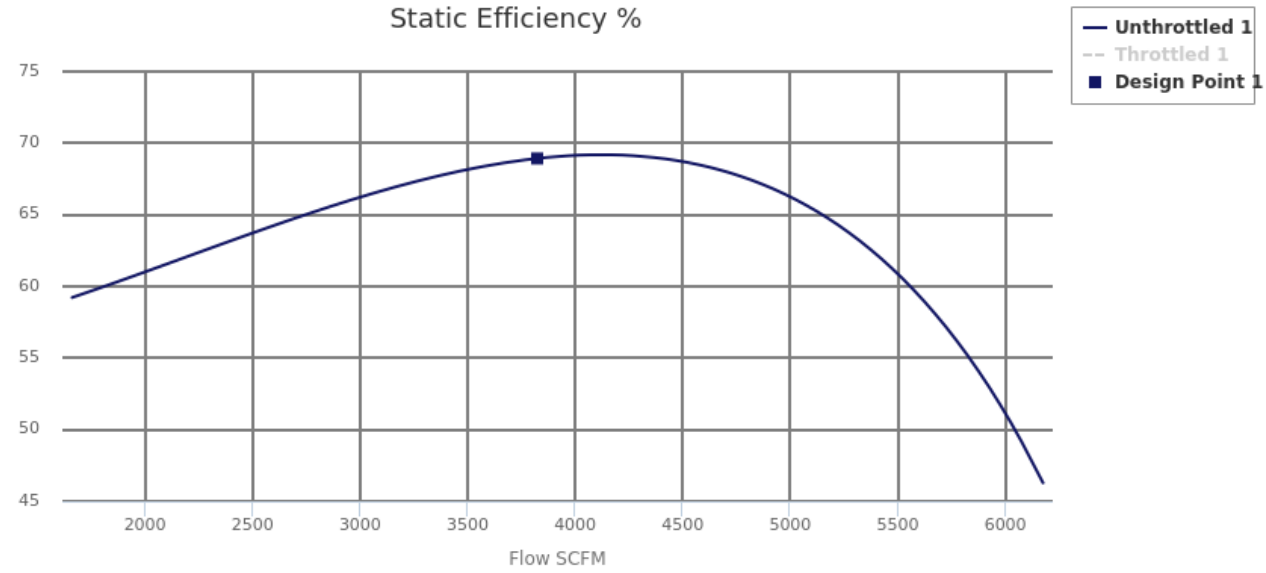
HOFFMAN LAMSON
CF SELECT plus

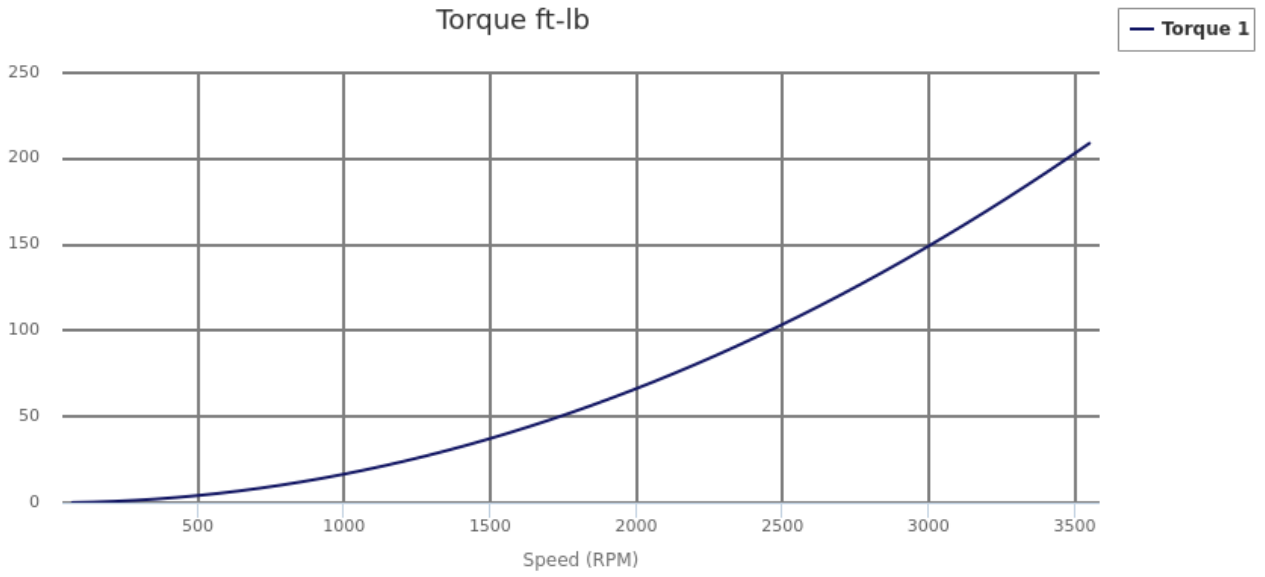




HOFFMAN LAMSON
CF SELECT plus







*Multi*Gard *II*

*Multi*Gard *II* OPERATIONS MANUAL
(CUSTOMER)
S.O.

REV. 1.0

July 12, 2017

NOTE: This manual is a Master Manual that contains features that may or may not be present for your particular model number. A customized manual will be provided with each order. This document is designed to be used for reference purposes only.

Gardner Denver, Inc.
200 Simko Blvd
Charleroi, PA
15022
PHONE: (724) 239-1562
FAX: (724) 239-1503

TABLE OF CONTENTS

1. GENERAL DESCRIPTION

MultiGard II is a product for monitoring, displaying and controlling blower conditions. It is a multi-channel unit that monitors up to 24 analog and 14 discrete inputs simultaneously. Each MultiGard II is custom configured to monitor conditions that can affect operation of the blower.

This unit is configured for the following:

Monitoring blower current with surge and overload warnings and alarms;

Blower current is monitored and used for inlet valve control for flow control as well as surge and overload prevention;

Monitoring of blower inlet and outlet bearing vibration with high vibration warnings and alarms;

Monitoring of blower inlet and outlet bearing temperature with high temperature warnings and alarms;

Monitoring of motor winding temperatures with high temperature warnings and alarms;

Monitoring of inlet air temperature with temperature compensation for CFM and Surge Setpoints and high temperature warnings and alarms;

Monitoring of outlet (discharge) air temperature with high temperature warnings and alarms;

2. SPECIFICATIONS

2.1 Mechanical

The MultiGard II is packaged in a modular form. It consists of a Display Module and a I/O programmable controller. The display module is connected to the controller via a communications cable, and is mounted through the door of the control enclosure for operator access. All field wiring is terminated at the terminal blocks located within the control panel.

2.2 Environmental

The MultiGard II display module and enclosure are designed to meet NEMA 4 and 4X (indoor use) applications. The final NEMA rating is dependent upon the rating of the panel in which it is installed.

2.3 Electrical

MultiGard II I/O Modules

The I/O Modules contain the following:

- One 4-20mA input for monitoring blower current
- Two 4-20mA inputs for blower bearing vibration
- Two RTD inputs for blower bearing temperatures
- Two RTD inputs for motor bearing temperatures
- Six RTD inputs for motor winding temperatures
- One RTD input for inlet air temperature
- One RTD input for outlet air temperature
- One 4-20mA input for remote amps command
- One 4-20mA input for inlet valve position
- One 4-20mA output for inlet valve control

- One 4-20mA output for input valve position re-transmission
- One 120VAC input for blower running input
- One 120VAC input for reset input
- One 120VAC input for alarm acknowledge
- One 120VAC input for local mode
- One 120VAC input for remote mode
- One 120VAC input for local blower start
- One 120VAC input for local blower stop
- One 120VAC input for remote blower start
- One 120VAC input for remote blower stop
- One 120VAC relay contact for common warning indication
- One 120VAC relay contact for blower ready indication
- One 120VAC relay contact for blower running indication
- One 120VAC relay contact for blower off indication
- One 120VAC relay contact for blower run command (to motor starter)
- One 120VAC relay contact for horn annunciation
- Two 120VAC relay contacts for inlet valve open and close commands

All analog channels are provided with 12-bit resolution. A panel installed power supply is provided for 4-20mA loops.

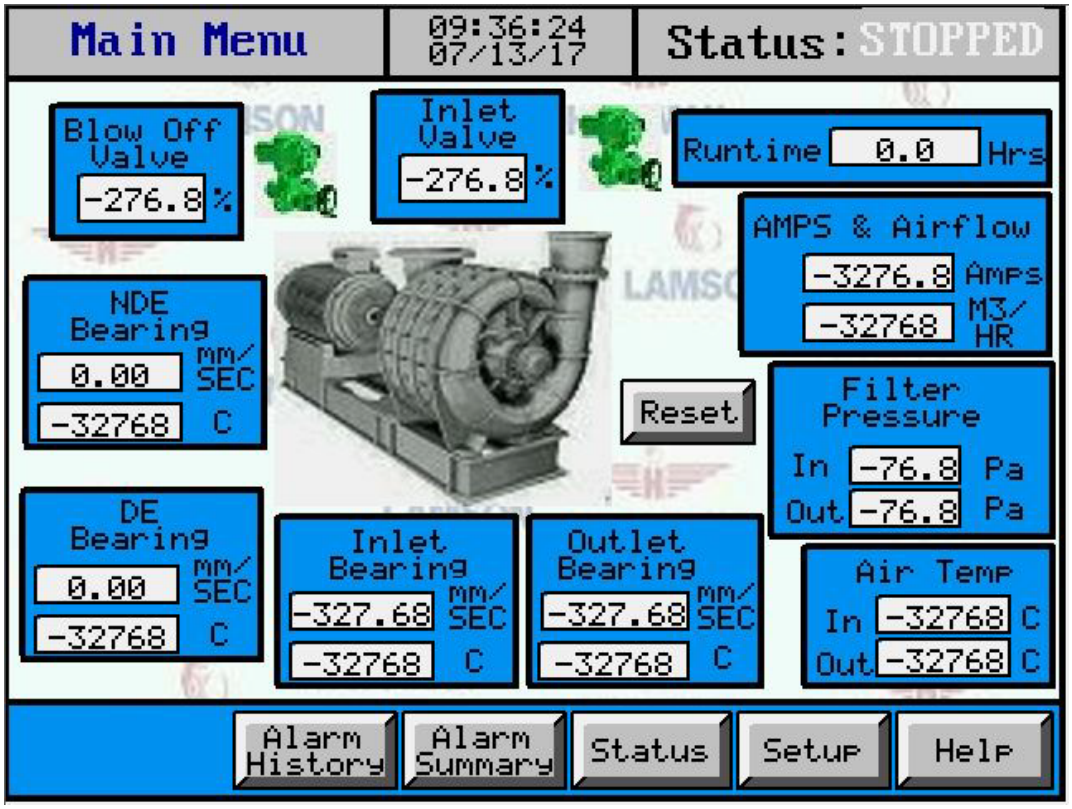
3. FUNCTIONAL DESCRIPTION

3.1 Displays

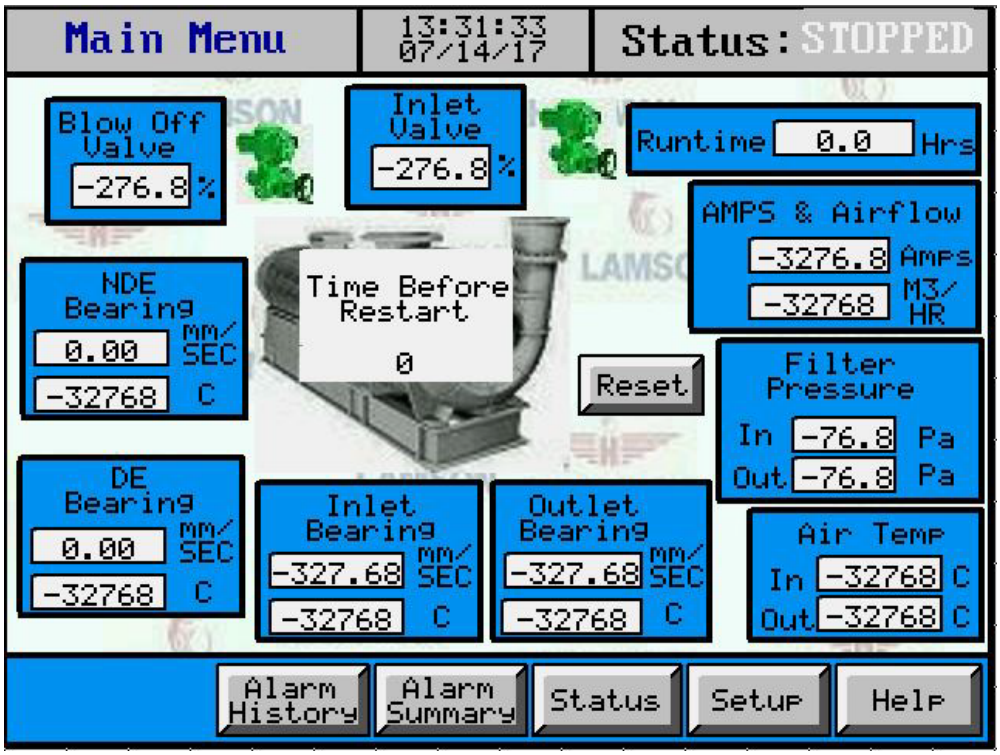
The MultiGard II will display monitored conditions in graphics and text-based formats. The graphical overview screen shows the blower status and values of the monitored variables. The display screens are listed below.

- Navigation Bar – The navigation bar is displayed at the bottom of each display. Pressing a button will take the user to the appropriate display.

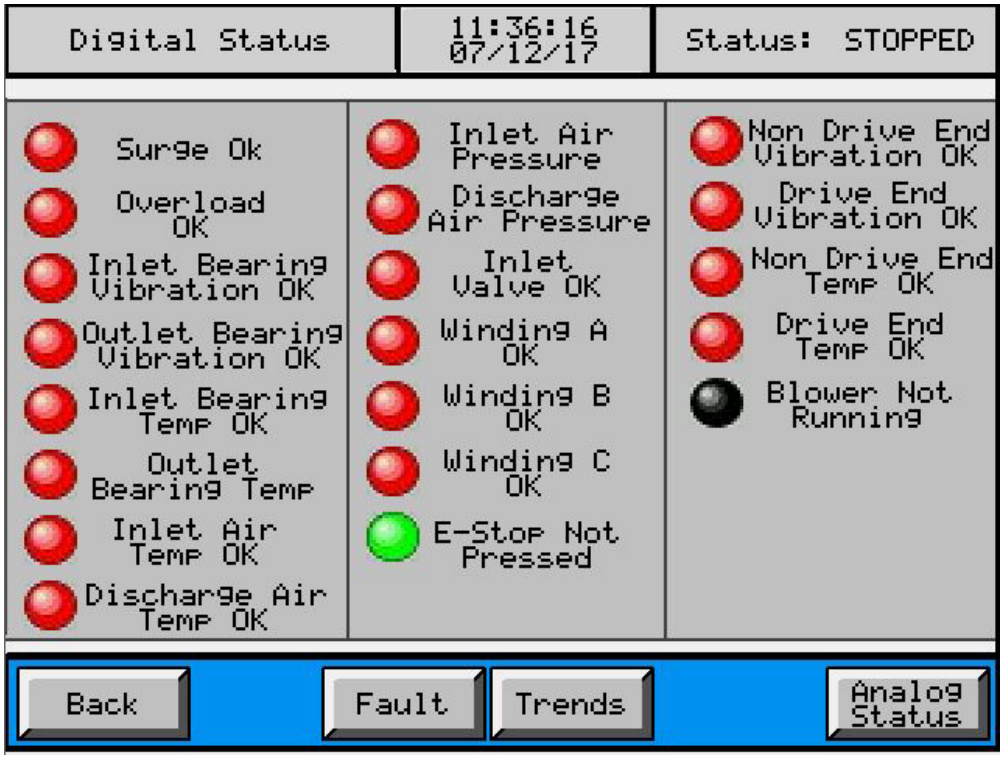
- Overview – The overview screen is provided to give an overall picture of the system status. Monitored variables and blower status information are shown to provide a quick assessment of the system.



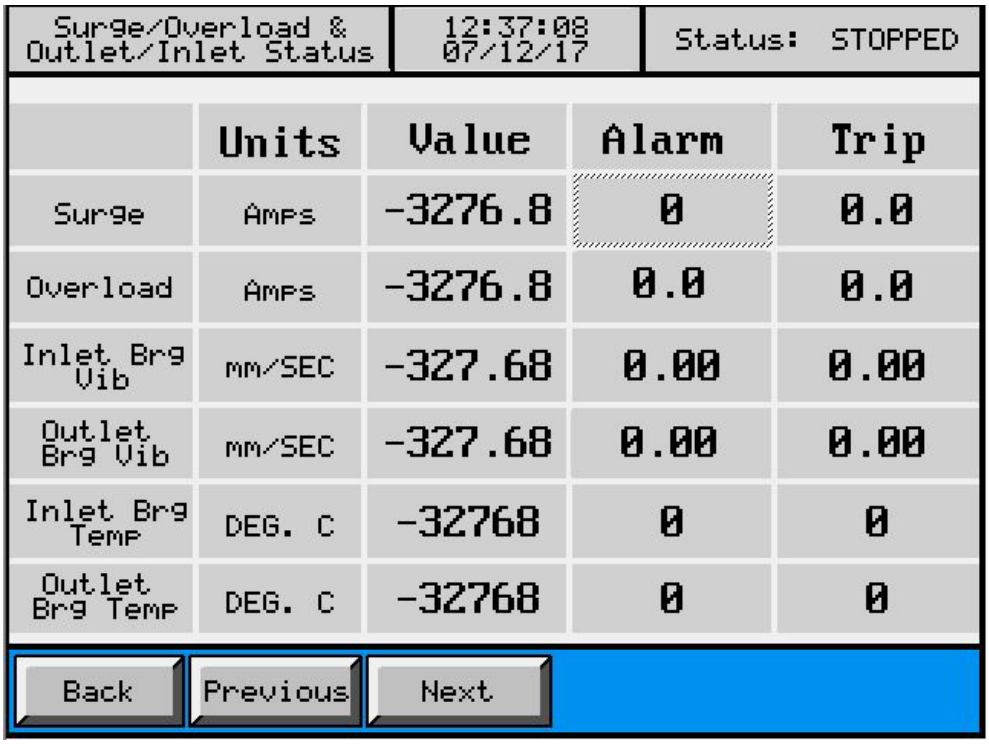
- Each time the blower stops, the time before restart timer counts down the seconds before the blower will be allowed to restart.



- Digital Status – The digital status screen is accessed from the main display by pressing **Status>Digital Status.** This screen displays the digital statuses. If a particular application is disabled, the corresponding statuses will not be displayed.



- Analog Status – The analog status screen is accessed from the main display by pressing **Status>Analog Status.** This screen display the analog statuses. If a particular application is disable, the corresponding statuses will not be displayed. Press next or previous to move between the Analog Status screens.



- Help Screen – The help screen is accessed from the main display by pressing **Help**. This page displays contact information relating to the blower equipment and controls equipment. Pressing the Revere button will display a screen showing Revere's contact information.

Trend displays use graphs to indicate the measured value of the monitored variables over a period of time. The display may also be “held” by pressing the **PAUSE** button on the touch-screen. The actual value of each variable is displayed beside the graph. This unit is configured to provide the following displays:

- Flow/Speed Trend – This screen is accessed from the main screen by pressing **Status>Trends>Flow/Speed** This screen displays the present values of the blower motor current and blower inlet flow rate.

- Blower Inlet/Outlet Bearing Vibration Trend – This screen is accessed from the main screen by pressing **Status>Trends>Vibration>Blower Vibration**. This screen displays blower inlet and outlet bearing vibration.

- Motor Drive End/Non-Drive End Bearing Vibration Trend – This screen is accessed from the main screen by pressing **Status>Trends>Vibration>Motor Vibration**. This screen displays motor drive end and non-drive end bearing vibration.

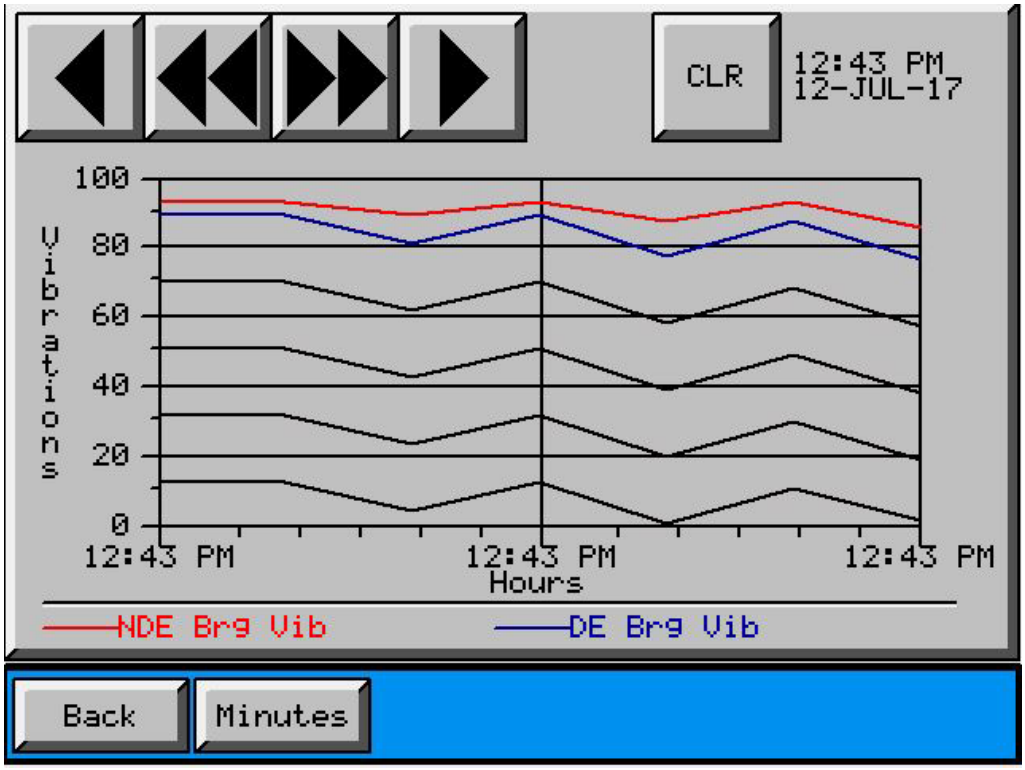
- Blower Inlet/Outlet Bearing Temperature Trend – This screen is accessed from the main screen by pressing **Status>Trends>Brg Temp>Blower Brg Temp**. This screen displays blower inlet and outlet bearing temperature.

- Motor Drive End/Non-Drive End Bearing Temperature Trend – This screen is accessed from the main screen by pressing **Status>Trends>Brg Temp>Motor Brg Temp**. This screen displays motor inlet and outlet bearing temperature.

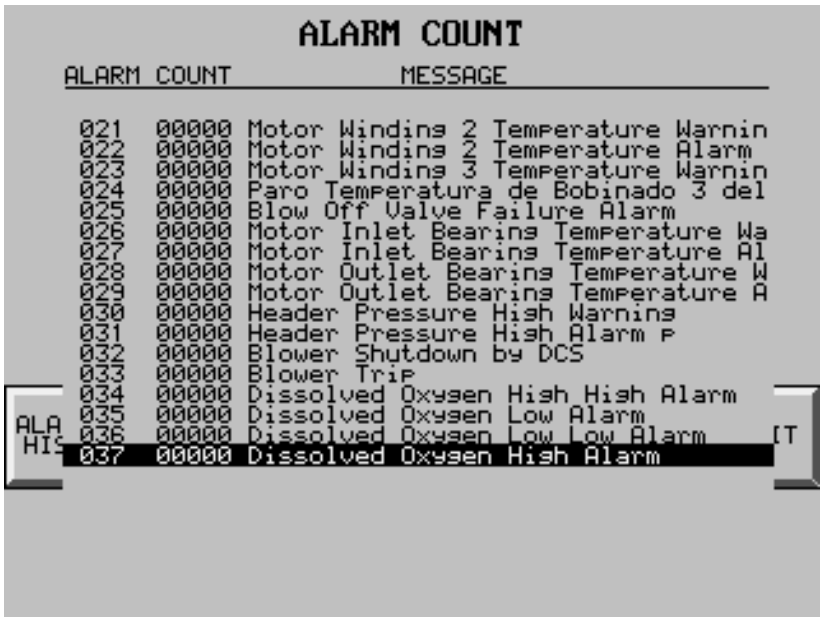
- Inlet/Discharge Air Temperature Trend – This screen is accessed from the main screen by pressing **Status>Trends>Air Temp**. This screen displays blower inlet and discharge air temperatures.

- Inlet/Discharge Air Pressure Trend – This screen is accessed from the main screen by pressing **Status>Trends>Pressure**. This screen displays the Inlet and Discharge Air Pressure.

- Motor Winding A, B, C Temperature Trend – This screen is accessed from the main screen by pressing **Status>Trends>Winding**. This screen displays motor winding A, B, and C temperatures.



- Alarm Summary – The alarm summary screen is accessed from the main display by pressing **Alarm Summary**. Active alarms are displayed in the alarm summary. Pressing the **Clear** button will clear the count of the highlighted alarm. **Clear All** will clear the alarm count for every alarm on the list.

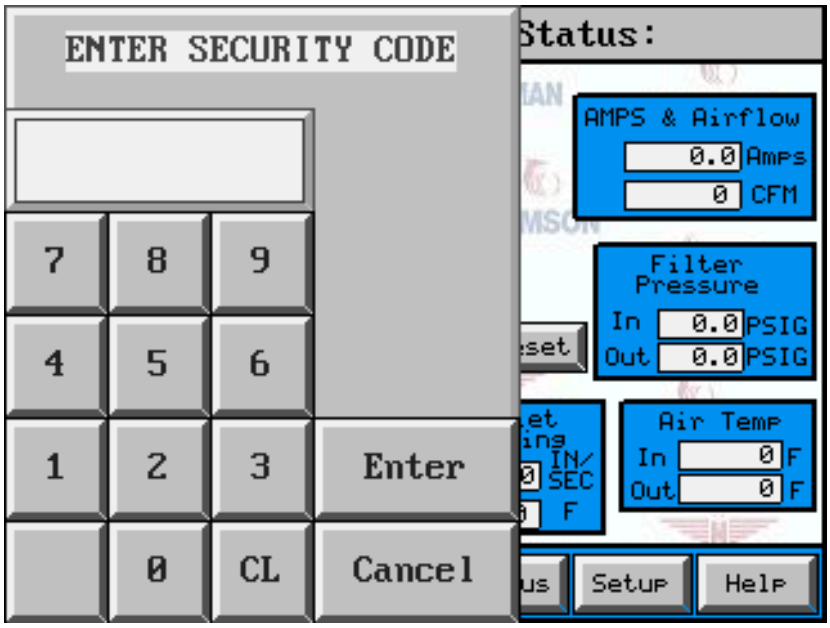


- Alarm History – The alarm summary screen is accessed from the main display by pressing **Alarm History**. Alarms are recorded in the alarm history. Pressing details will show you the

specifics of each alarm. The alarm messages remain in the list until the **Clear All** button is pressed.

- Passwords – Set-up screens are password protected for security. If a secured screen is requested to be displayed, a keypad will appear requesting the password. If an incorrect password is entered, the user is returned to the original screen. If the correct password is entered, the requested screen is displayed. The default operator password is 0. The default supervisor password is 123.

  The supervisor is allowed access to all areas within the operator interface. These areas include the normal operator setup screens as well as the EZ Touch maintenance screen. The EZ Touch maintenance screen is used to configure the communication settings and adjust the screen display settings. See the display manual for more information on these functions. All users have access to the status screens that display information only, such as the main menu, overview, and alarm screens. The user must login as an operator in order to access the setup screens where setpoints are changed. Finally, the supervisor has access to all screens, as well as the EZ Touch maintenance screen.

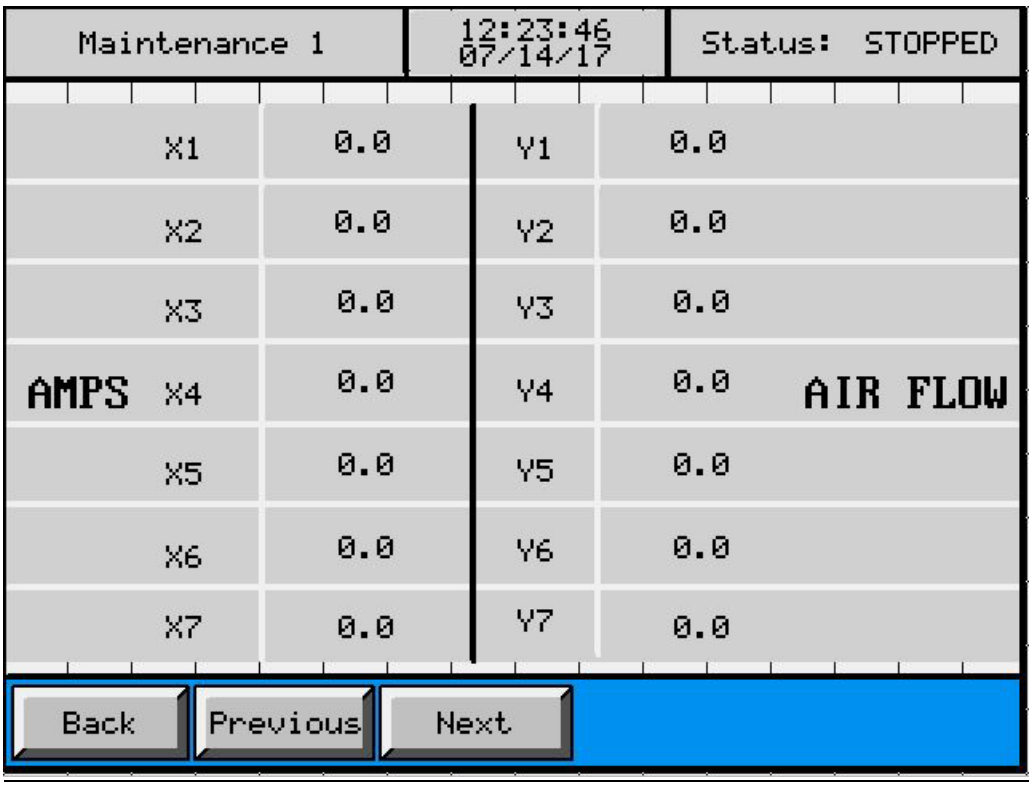


3.2 Setpoints

All MultiGard II setup screens can be accessed on the main screen by pressing **Setup**. The following screens are available in this unit: Maintenance (1-3), Common Setup, Analog Setup, and Controls Setup (Blower Control, PID Control).

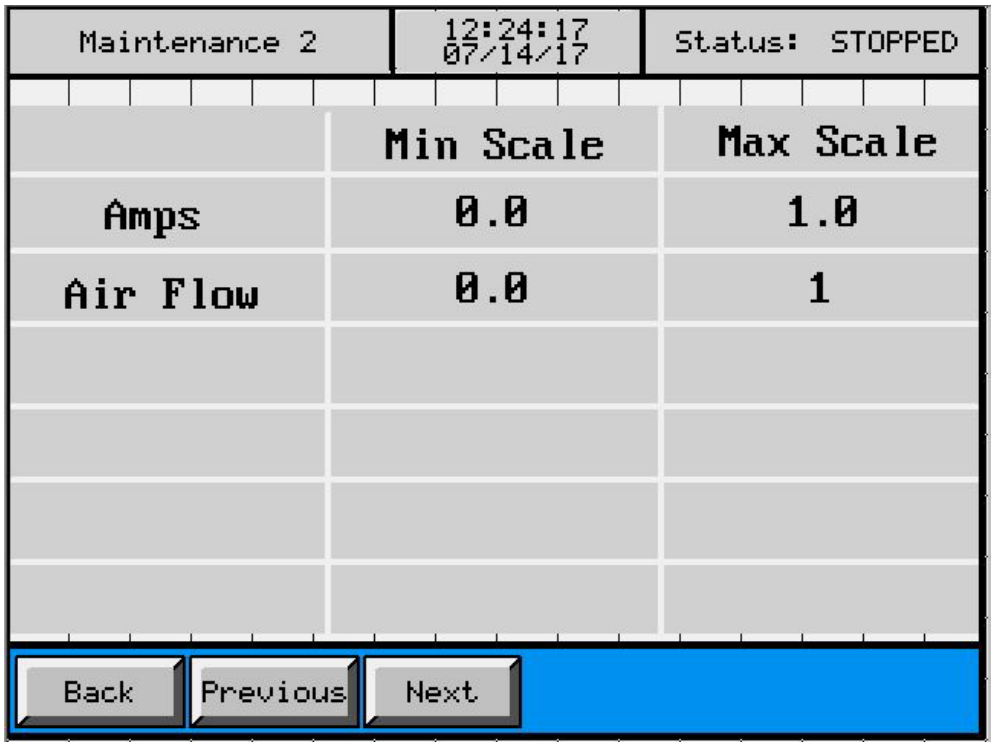
Maintenance Screen page 1

This maintenance screen is accessed from the main display by pressing **Setup>Maintenance**. On this screen the user can enter blower amps curve data points.



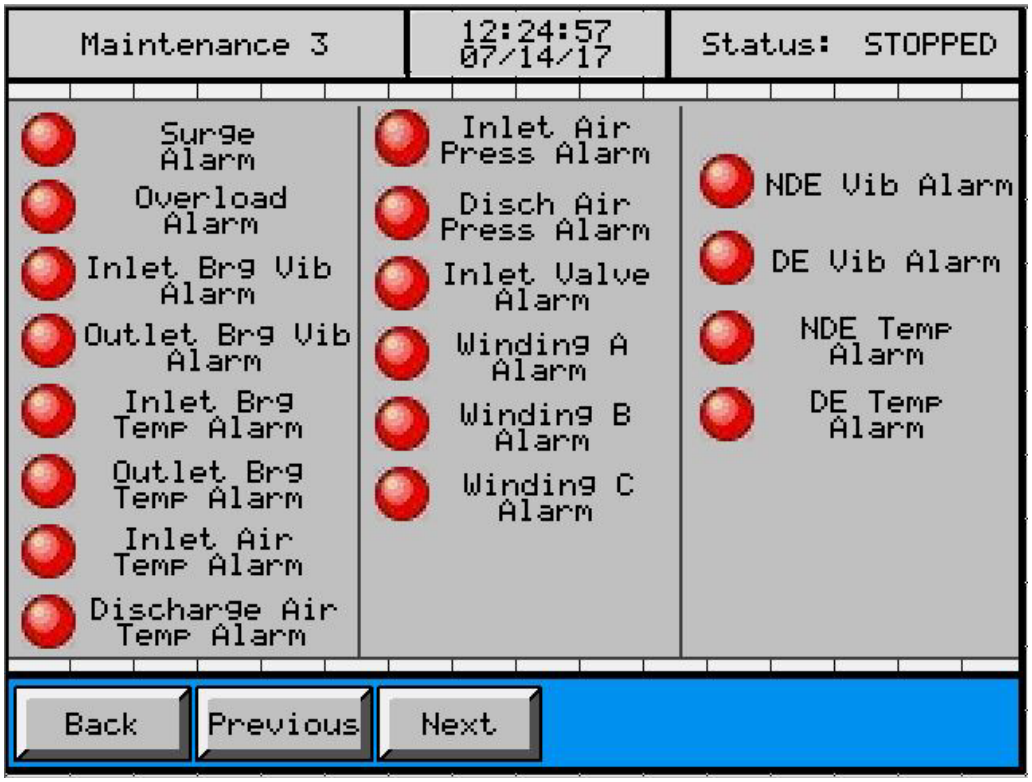
Maintenance Screen page 2

This maintenance screen is accessed by pressing the **Previous** and **Next** buttons on the maintenance screens. On this screen the user can enter minimum and maximum scaling setpoints.



Maintenance Screen page 3

This maintenance screen is accessed by pressing the **Previous** and **Next** buttons on the maintenance screens. On this screen the user can activate or deactivate alarms. This screen can be used to assist in configurability, testing, startup and troubleshooting.



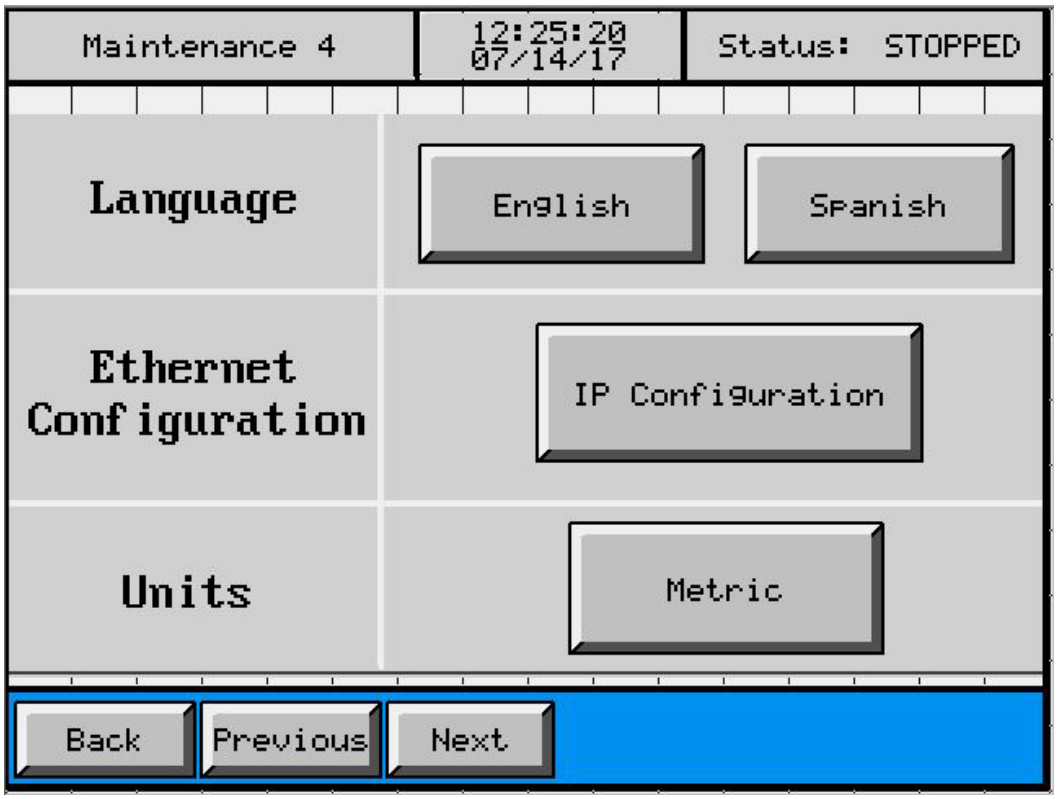
Maintenance Screen page 4

This maintenance screen is accessed by pressing the **Previous** and **Next** buttons on the maintenance screens. On this screen the user can configure several display options.

Language: Press the **Language** block to toggle the language between English or Spanish.

Ethernet Configuration: Press the **IP Configuration** block to change the IP Address, Subnet, and Gateway of the EZ Touch Panel.

Metric Units: Press the **Metric Units** block enable or disable the use of metric units.



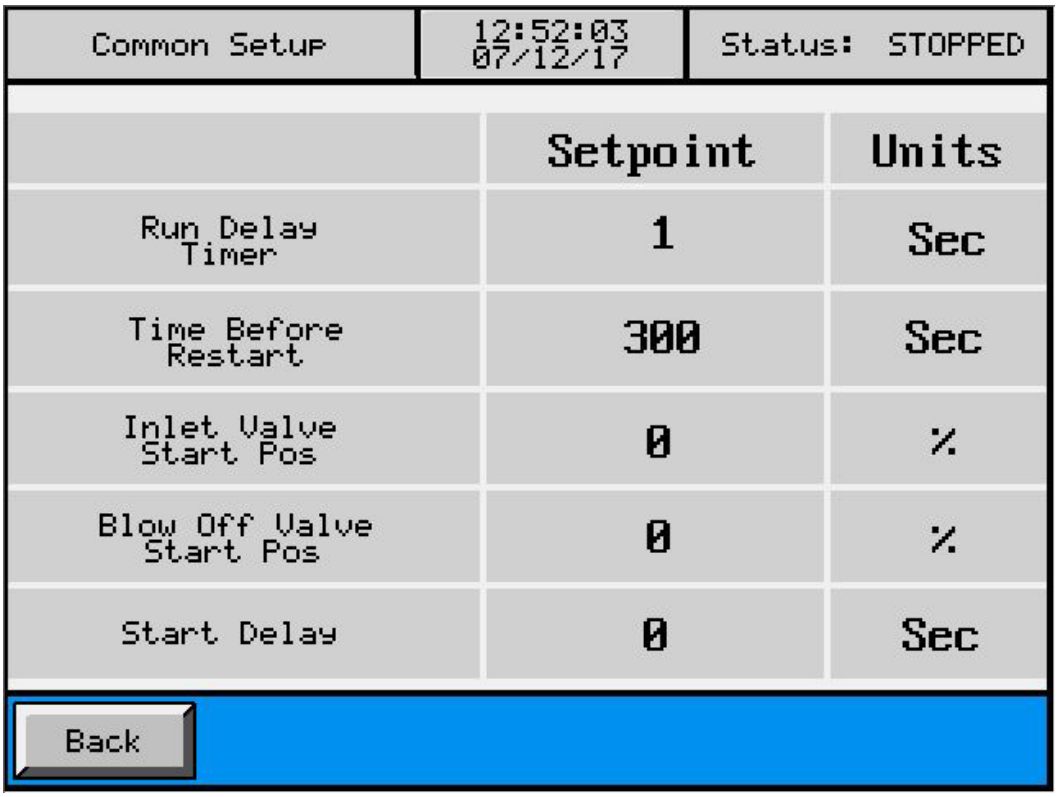
Common Setup

This common setup screen is accessed from the main screen by pressing **Setup>Common Setup**. On this screen the user can assign units to different variable types. Press the box next to the variable type, type in the desired unit, and press enter.

RUN DELAY (SEC): The delay time for meter types requiring delays after the blower is started. It is the delay time that begins timing when the MultiGard II receives the run signal from the motor starter delaying any alarms on initial start-up. This allows the alarms to ignore abnormal readings while the motor is getting up to normal speed. The setting range is 10 to 120. The default setting is 15 seconds.

Time Before Restart (SEC): The amount of time that the blower must be off before it is allowed to restart. This parameter should be set to allow the blower enough time to coast to a stop before being re-started. A count-down timer is displayed on the overview screen while this timer is timing. The setting range is 300 to 30000. The default setting is 300 seconds.

INLET VALVE START POS (%): The initial valve position command when the blower is first started. This setting is maintained for the duration of the RUN DELAY timer. Once the RUN DELAY timer expires, and if the inlet valve control is in AUTO mode, then the PID control will adjust the valve position in effort to maintain the control setting. Default setting is 25 percent.



Analog Setup

This common setup screen is accessed from the main screen by pressing **Setup>Analog Setup**. On this screen the user can adjust alarm, trip, and delay setpoints.

SURGE ALARM (AMPS): Sets the surge warning setpoint. When the motor current falls below this point, a warning condition will be indicated. The warning will automatically set and reset when the amps go above or below this point. The units of this setpoint are displayed in Amps. The setting ranges from 10 to the full scale of the meter. When configured for temperature compensation, the compensated surge warning alarm setpoint will also be displayed.

SURGE TRIP (AMPS): Sets the surge alarm setpoint. When the motor current falls below this point and remains there for the Surge Alarm Delay time period, an alarm condition will be indicated and the blower will be shut down. The units of this setpoint are displayed in Amps. The setting ranges from 10 to the full scale of the meter. When configured for temperature compensation, the compensated surge alarm setpoint will also be displayed.

SURGE ALARM DELAY (SEC): Sets the delay before the blower will shut down after the motor current falls below the surge trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

OVERLOAD ALARM (AMPS): Sets the overload warning setpoint. When the motor current rises above this point, a warning condition will be indicated. The warning will automatically set and reset when the amps go above or below this point. The units of this setpoint are displayed in Amps. The setting ranges from 10 to the full scale of the meter.

OVERLOAD TRIP (AMPS): Sets the overload alarm setpoint. When the motor current rises above this point and remains there for the Overload Alarm Delay time period, an alarm condition

will be indicated and the blower will be shut down. The units of this setpoint are displayed in Amps. The setting ranges from 10 to the full scale of the meter.

OVERLOAD DELAY (SEC): Sets the delay before the blower will shut down after the motor current rises above the overload trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

INLET BEARING VIBRATION ALARM: Sets the high inlet bearing vibration warning setpoint. When the inlet bearing vibration exceeds this setpoint, a warning condition will be indicated. The warning is automatically reset when the vibration level drops below the setpoint. The units of this setpoint are displayed in in/sec or mm/sec with default values of 0.40 in/sec or 10 mm/sec.

INLET BEARING VIBRATION TRIP: Sets the high inlet bearing vibration alarm setpoint. When the inlet bearing vibration exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in in/sec or mm/sec with default values of 0.75 in/sec or 19 mm/sec.

INLET BEARING VIBRATION DELAY (SEC): Sets the delay before the motor will be shut down after the inlet bearing vibration exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

OUTLET BEARING VIBRATION ALARM: Sets the high outlet bearing vibration warning setpoint. When the outlet bearing vibration exceeds this setpoint, a warning condition will be indicated. The warning is automatically reset when the vibration level drops below the setpoint. The units of this setpoint are displayed in in/sec or mm/sec with default values of 0.40 in/sec or 10 mm/sec.

OUTLET BEARING VIBRATION TRIP: Sets the high outlet bearing vibration alarm setpoint. When the outlet bearing vibration exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in in/sec or mm/sec with default values of 0.75 in/sec or 19 mm/sec.

OUTLET BEARING VIBRATION DELAY (SEC): Sets the delay before the motor will be shut down after the outlet bearing vibration exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

INLET BEARING TEMPERATURE ALARM: Sets the high inlet bearing temperature warning setpoint. When the inlet bearing temperature exceeds this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 220 degrees Fahrenheit or 104 degrees Celsius.

INLET BEARING TEMPERATURE TRIP: Sets the high inlet bearing temperature alarm setpoint. When the inlet bearing temperature exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 230 degrees Fahrenheit or 110 degrees Celsius.

INLET BEARING TEMPERATURE DELAY: Sets the delay before the motor will be shut down after the inlet bearing temperature exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

OUTLET BEARING TEMPERATURE ALARM: Sets the high outlet bearing temperature warning setpoint. When the outlet bearing temperature exceeds this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 220 degrees Fahrenheit or 104 degrees Celsius.

OUTLET BEARING TEMPERATURE TRIP: Sets the high outlet bearing temperature alarm setpoint. When the outlet bearing temperature exceeds this setpoint, an alarm condition will be

indicated and the motor will be shut down. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 230 degrees Fahrenheit or 110 degrees Celsius.

OUTLET BEARING TEMPERATURE DELAY: Sets the delay before the motor will be shut down after the outlet bearing temperature exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

INLET (Diff) PRESS ALARM: Sets the inlet air filter pressure warning setpoint. When the differential pressure is below this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees inches of water column or millimeters of water column with default values of 10 In W.C. or 250 mm W.C.

INLET (Diff) PRESS TRIP: Sets the inlet air filter pressure alarm setpoint. When the differential pressure is below this setpoint, an alarm condition will be indicated. The motor is not shut down on this alarm. The units of this setpoint are displayed in degrees inches of water column or millimeters of water column with default values of 12 In W.C. or 300 mm W.C.

INLET (Diff) PRESSURE DELAY (SEC): Sets the delay before the alarm is triggered after the differential pressure is below the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10.

INLET (Diff) HIGH PRESSURE ALARM: Sets the high inlet air filter pressure warning setpoint.

MOTOR WINDING TEMPERATURE ALARM: Sets the high motor winding temperature warning setpoint. When the temperature exceeds this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 266 degrees Fahrenheit or 130 degrees Celsius.

MOTOR WINDING TEMPERATURE TRIP: Sets the high motor winding temperature alarm setpoint. When the temperature exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 311 degrees Fahrenheit or 155 degrees Celsius.

MOTOR WINDING TEMPERATURE ALARM DELAY: Sets the delay before the motor will be shut down after the temperature exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10.

NON-DRIVE END BEARING VIBRATION ALARM: Sets the non-drive end bearing vibration warning setpoint. When the inlet bearing vibration exceeds this setpoint, a warning condition will be indicated. The warning is automatically reset when the vibration level drops below the setpoint. The units of this setpoint are displayed in in/sec or mm/sec with default values of 0.40 in/sec or 10 mm/sec.

NON-DRIVE END BEARING VIBRATION TRIP: Sets the non-drive end bearing vibration alarm setpoint. When the non-drive end bearing vibration exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in in/sec or mm/sec with default values of 0.75 in/sec or 19 mm/sec.

NON-DRIVE END BEARING VIBRATION DELAY (SEC): Sets the delay before the motor will be shut down after the non-drive end bearing vibration exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

DRIVE END BEARING VIBRATION ALARM: Sets the drive end bearing vibration warning setpoint. When the drive end bearing vibration exceeds this setpoint, a warning condition will be indicated. The warning is automatically reset when the vibration level drops below the setpoint.

The units of this setpoint are displayed in in/sec or mm/sec with default values of 0.40 in/sec or 10 mm/sec.

DRIVE END BEARING VIBRATION TRIP: Sets the drive end bearing vibration alarm setpoint. When the drive end bearing vibration exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in in/sec or mm/sec with default values of 0.75 in/sec or 19 mm/sec.

DRIVE END BEARING VIBRATION DELAY (SEC): Sets the delay before the motor will be shut down after the drive end bearing vibration exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

NON-DRIVE END HIGH TEMP ALARM: Sets the non-drive end high temperature warning setpoint. When the non-drive end high temperature exceeds this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 135 degrees Fahrenheit or 57 degrees Celsius.

NON-DRIVE END HIGH TEMP TRIP: Sets the non-drive end high temperature alarm setpoint. When the non-drive end temperature exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 145 degrees Fahrenheit or 63 degrees Celsius.

NON-DRIVE END TEMPERATURE ALARM DELAY: Sets the delay before the motor will be shut down after the non-drive end temperature exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

DRIVE END HIGH TEMPERATURE ALARM: Sets the drive end high temperature warning setpoint. When the drive end temperature exceeds this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 240 degrees Fahrenheit or 114 degrees Celsius.

DRIVE END HIGH TEMPERATURE TRIP: Sets the drive end high temperature alarm setpoint. When the drive end temperature exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 250 degrees Fahrenheit or 121 degrees Celsius.

DRIVE END TEMPERATURE ALARM DELAY: Sets the delay before the motor will be shut down after the drive end temperature exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

DISCHARGE PRESSURE ALARM: Sets the discharge pressure warning setpoint. When the pressure is below this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees inches of water column or millimeters of water column with default values of 10 In W.C. or 250 mm W.C.

DISCHARGE PRESSURE TRIP: Sets the discharge pressure alarm setpoint. When the pressure is below this setpoint, an alarm condition will be indicated. The motor is not shut down on this alarm. The units of this setpoint are displayed in degrees inches of water column or millimeters of water column with default values of 12 In W.C. or 300 mm W.C.

DISCHARGE PRESSURE DELAY (SEC): Sets the delay before the alarm is triggered after the pressure is below the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10.

INLET AIR TEMPERATURE ALARM: Sets the inlet air temperature warning setpoint. When the temperature exceeds this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 240 degrees Fahrenheit or 114 degrees Celsius.

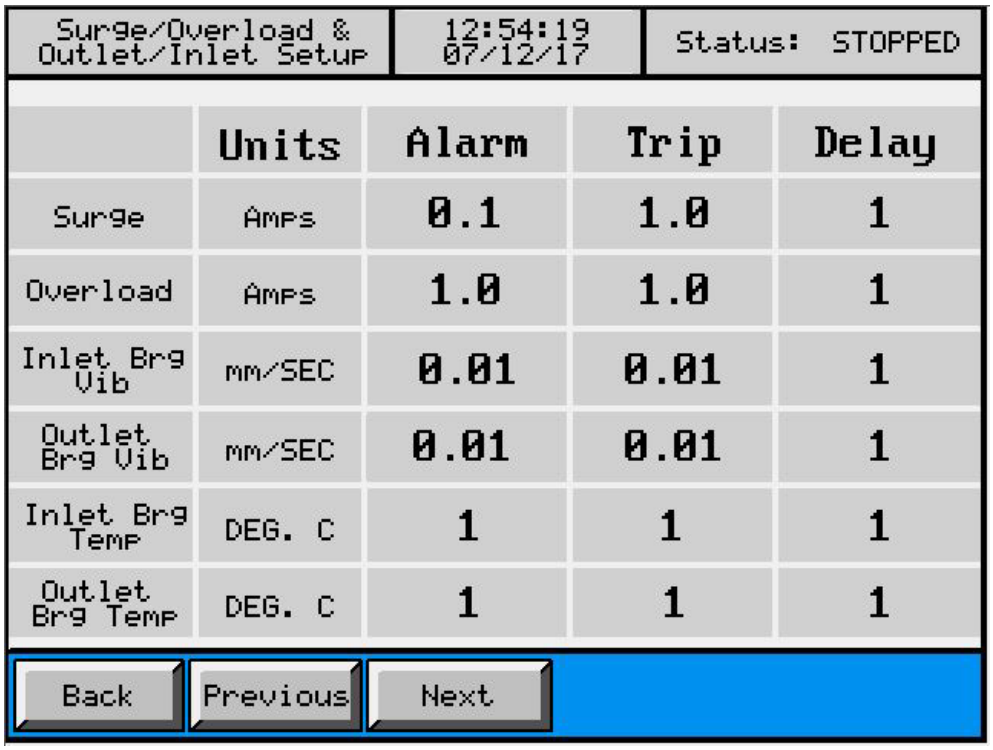
INLET AIR TEMPERATURE TRIP: Sets the inlet air temperature alarm setpoint. When the temperature exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 250 degrees Fahrenheit or 121 degrees Celsius.

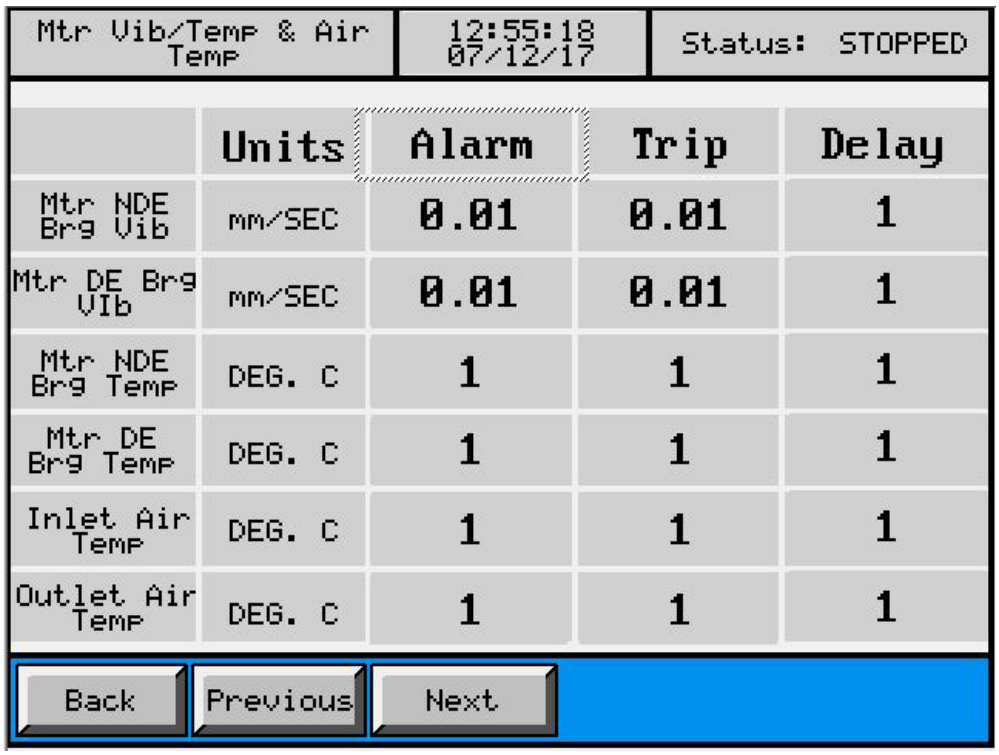
INLET AIR TEMPERATURE DELAY: Sets the delay before the motor will be shut down after the inlet air temperature exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

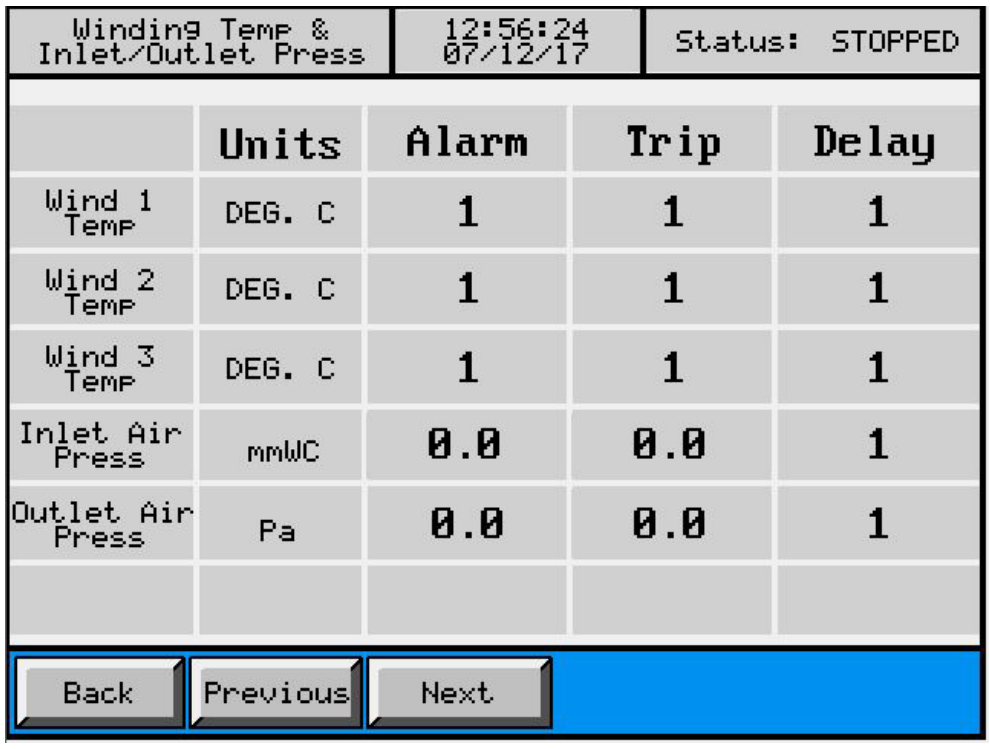
DISCHARGE AIR TEMPERATURE ALARM: Sets the discharge air temperature warning setpoint. When the temperature exceeds this setpoint, a warning condition will be indicated. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 240 degrees Fahrenheit or 114 degrees Celsius.

DISCHARGE AIR TEMPERATURE TRIP: Sets the discharge air temperature alarm setpoint. When the temperature exceeds this setpoint, an alarm condition will be indicated and the motor will be shut down. The units of this setpoint are displayed in degrees Fahrenheit or Celsius with default values of 250 degrees Fahrenheit or 121 degrees Celsius.

DISCHARGE AIR TEMPERATURE DELAY: Sets the delay before the motor will be shut down after the discharge air temperature exceeds the trip setpoint. The units of this setpoint are displayed in seconds with a default value of 10. The setting ranges from 1 to 50 seconds.

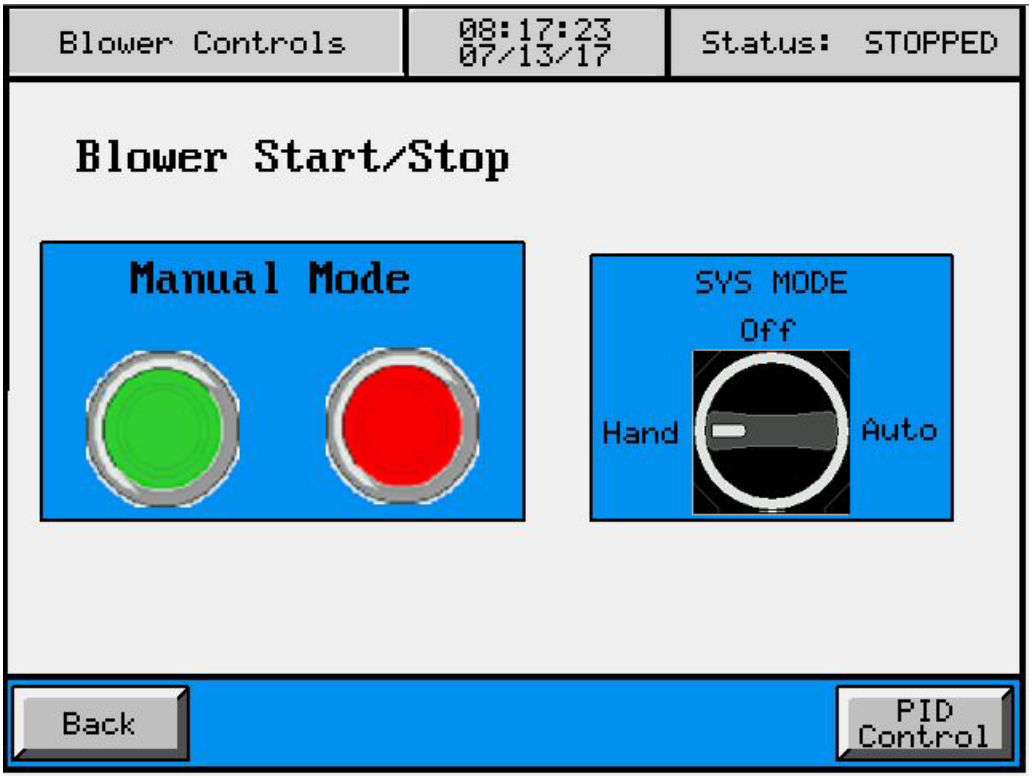






Blower Control

The blower control screen is accessed from the main screen by pressing **Setup>Control Setup >Blower Control.** This display allows the user to operate the blower from the HMI.



PID Setup

The PID setup screen is accessed from the main screen by pressing **Setup>Control Setup>PID Control**. This page allows the user to adjust setpoints related to the PID loops.

PID AUTO/MANUAL MODE – The PID control may be placed in manual or automatic control by touching the button on the top-right corner of the PID block. In manual mode, the manual command position is sent.

PROCESS VARIABLE (PV) - Displays the current operating process variable.

SETPOINT (SP) – Displays the current operating setpoint. Touching the display here will allow you to enter the local control setpoint.

CONTROL VARIABLE (CV) - Displays the current operating control variable.

PROPORTIONAL GAIN (Kc) – Proportional gain value for the PID control loop. Increase for faster control or decrease for slower control. Too large of a gain will cause the controls to overshoot and become unstable. Too small of a gain will cause excessive time delays before reaching the setting.

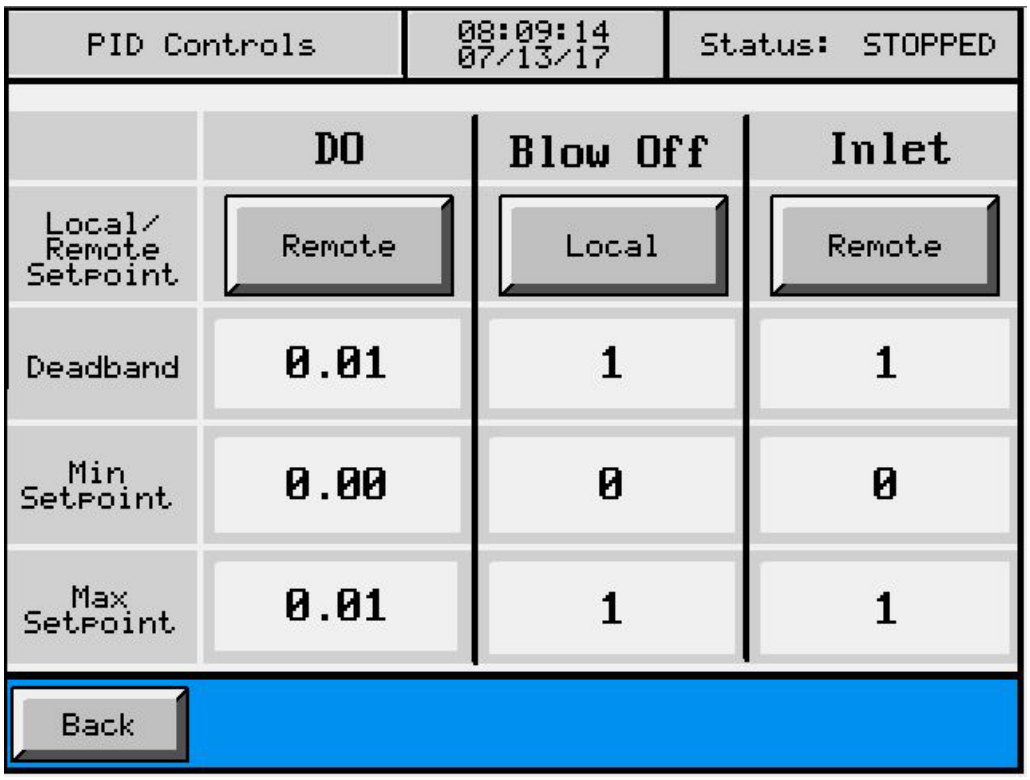
INTEGRAL TIME (Ti) – This is the integral gain value for the PID control loop in terms of minutes per reset. Decrease for faster control or increase for slower control. Too small a value will cause the controls to overshoot and become unstable. Too large a value will cause excessive time delays before reaching the setting.

For more setpoints, press the **More** button at the bottom of the PID block.

LOCAL/REMOTE SETPOINT – Select the setpoint control as either local or remote. The local setpoint is entered locally by touching the SP display. The remote setpoint is controlled from an analog input signal.

DEADBAND – The margin of allowable error for control. If the process is within the range of this setting, no further action is taken by the PID control until the process moves outside this range.

MIN/MAX SP – Enter minimum and maximum setpoint limits to prevent the system from being commanded to operate outside this range.



3.3 Keypad Functions

The operator interface provides touch-screen control. Simply touch the buttons on the screens to activate the buttons, change screens, or to change settings. When a numeric entry is required, a keypad will be displayed. Touch the backspace arrow to delete the numbers previously entered. Press **ESC** to exit the keypad without making changes. To enter a new value, key in the numbers and touch the enter key (down-left arrow located in the bottom-right portion of the keypad).

3.4 Control/Shutdown Functions

Surge Shutdown: If the motor current falls below the surge alarm setpoint for a programmed time, the blower will automatically be shut down.

Overload Shutdown: If the motor current exceeds the overload alarm setpoint for a programmed time, the blower will automatically be shut down.

Bearing Vibration Shutdown: If the bearing vibration exceeds the alarm setpoint for a programmed time, the blower will automatically be shut down.

Bearing Temperature Shutdown: If the bearing temperature exceeds the alarm setpoint for a programmed time, the blower will automatically be shut down.

Motor Winding Shutdown: If the motor winding temperature exceeds the alarm setpoint for a programmed time, the blower will automatically be shut down.

Inlet Air Shutdown: If the inlet air temperature exceeds the alarm setpoint for a programmed time, the blower will automatically be shut down.

Outlet Air Shutdown: If the Outlet air temperature exceeds the alarm setpoint for a programmed time, the blower will automatically be shut down.

4 OPERATIONS

4.1 Blower Start – Blower protection only, control by others

Note: As per standard procedure, the blower inlet valve (if equipped) should be fully closed before starting the blower to reduce motor inrush current. Once the blower begins to start, the valve can be slowly opened to bring motor amps above the surge point. Typically, the blower will be run closer to the design point.

Before starting the blower, it is helpful to display the overview screen in order to monitor the motor amps and blower airflow. This will allow the operator to view operation of the motor and blower while starting. The inlet valve should be adjusted to bring the motor amperage to a safe operation point. The operating point should be somewhere above the surge point and below the overload point on the bar graph.

When the blower is initially started a box displaying “WAIT” will appear at the top of the overview screen display. This confirms that a “run” signal has been given to the controller. The message will appear for the duration of the run delay timer. During this time, all warnings and alarms are ignored. After the timer expires, all warnings and alarms are armed.

4.1 Blower Sequence – Local/Remote start/stop and valve control

The blower may be started locally from the start/stop buttons when LOCAL mode is selected, or remotely though remote start/stop signals to the controller. The blower inlet valve should be fully closed before starting the blower to reduce motor inrush current. Once the blower begins to start, the valve will be opened to bring motor amps above the surge point. The valve will be held at the valve start position while the blower is starting. When the blower is initially started a box displaying “WAIT” will appear at the top of the overview screen display. This confirms that a “run” signal has been given to the controller. The message will appear for the duration of the run delay timer. During this time, all warnings and alarms are ignored. After the timer expires, all warnings and alarms are armed. After the initial run delay, the valve is automatically controlled from the PID control to maintain the configured setpoint. The setpoint may be selected as either local or remote control. In local control, a local setpoint may be entered by touching the setpoint display on the Overview page. In remote control, the blower setpoint is controlled from an external signal. The valve will automatically close when the blower stops. Once the blower stops, a minimum off timer prevents the blower from restarting until the minimum off time has expired. This allows the blower time to coast down before being called to run again.

4.2 Alarm Reset

When an alarm condition occurs, the MultiGard II will automatically shut down the blower and display an alarm message. The blower cannot be restarted until the MultiGard II is reset. To reset the unit, press the **RESET** button.

WARNING

Surge Protection

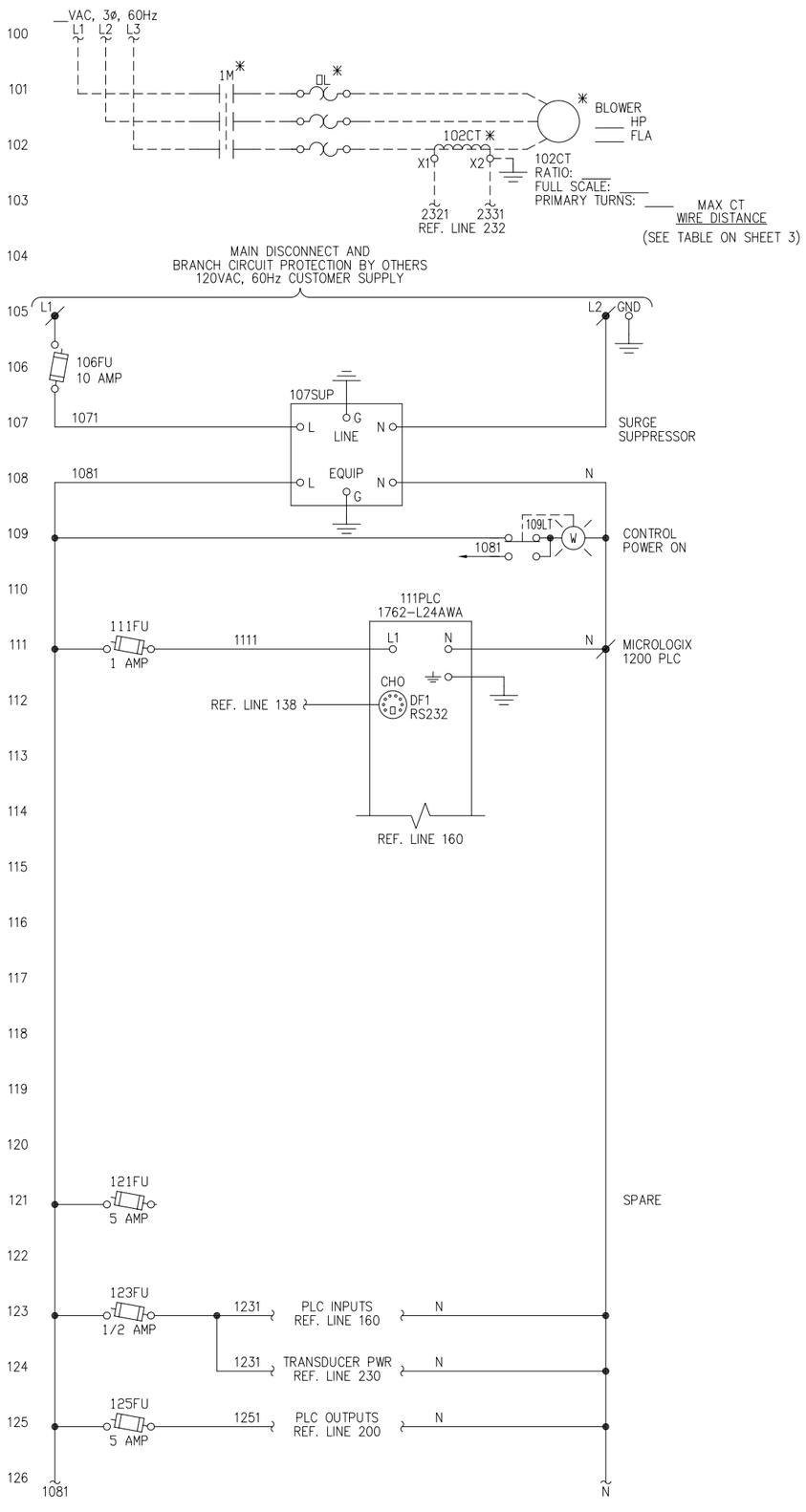
Important: Failure to follow this procedure will cause severe equipment damage and may void the warranty. A meter included in this shipment measures motor amperage for surge protection. It has been configured at the factory to protect your blower from low flow conditions, or surge. The actual surge point of the blower, relative to amperage, will change as the blower inlet temperature changes. A higher set point may be required when air temperature decreases.

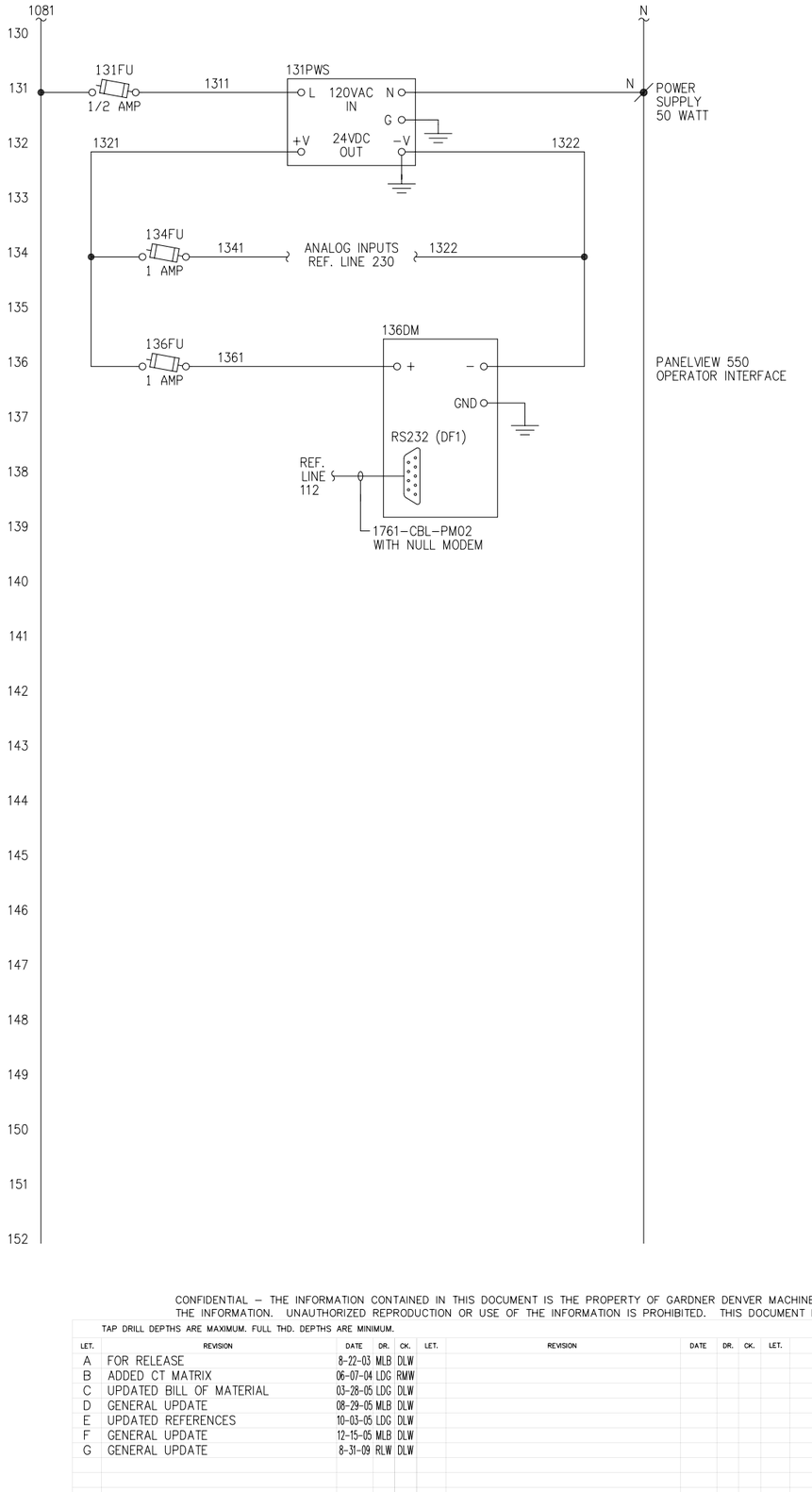
The meter is calibrated with performance curves reflecting standard inlet temperature condition of 68 degrees Fahrenheit (20 degrees Celsius). The following chart provides a multiplier to be used for adjustment of your surge setpoint relative to inlet temperature conditions, in order to achieve maximum protection of your equipment.

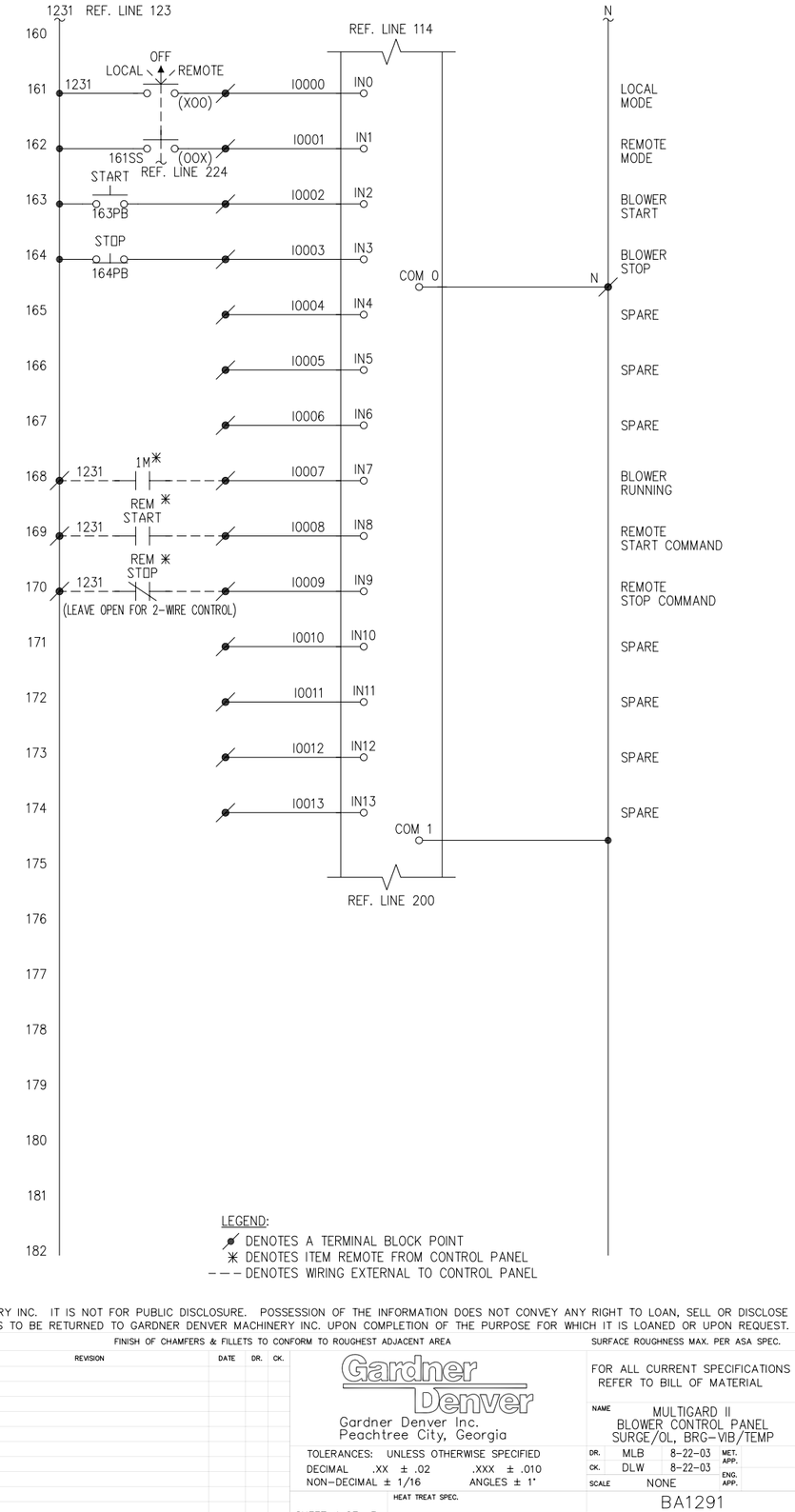
Degree F	Degree C	Multiplier
-40	-40	1.25
-22	-30	1.20
-4	-20	1.16
14	-10	1.11
32	0	1.07
50	10	1.04
68	20	1.00
86	30	0.97
104	40	0.94

IMPORTANT: This table must be modified if factory calibration is other than temperature above.

To adjust the setpoint, find the current inlet temperature and multiplier. Multiply the factory set value by the multiplier and set the Surge Alarm to that value.







LEGEND:
- ⁄ DENOTES A TERMINAL BLOCK POINT
- ✳ DENOTES ITEM REMOTE FROM CONTROL PANEL
- – – – DENOTES WIRING EXTERNAL TO CONTROL PANEL

TAP DRILL DEPTHS ARE MAXIMUM. FULL THD. DEPTHS ARE MINIMUM.

FINISH OF CHAMFERS & FILLETS TO CONFORM TO ROUGHEST ADJACENT AREA

SURFACE ROUGHNESS MAX. PER ASA SPEC.

LET.	REVISION	DATE	DR.	CK.
A	FOR RELEASE	8-22-03	MLB	DLW
B	ADDED CT MATRIX	06-07-04	LDG	RMW
C	UPDATED BILL OF MATERIAL	03-28-05	LDG	DLW
D	GENERAL UPDATE	08-29-05	MLB	DLW
E	UPDATED REFERENCES	10-03-05	LDG	DLW
F	GENERAL UPDATE	12-15-05	MLB	DLW
G	GENERAL UPDATE	8-31-09	RLW	DLW

Gardner Denver

Gardner Denver Inc.
Peachtree City, Georgia

FOR ALL CURRENT SPECIFICATIONS
REFER TO BILL OF MATERIAL

NAME: MULTIGARD II
BLOWER CONTROL PANEL
SURGE/OL, BRG-VIB/TEMP

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL .XX ± .02 .XXX ± .010
NON-DECIMAL ± 1/16 ANGLES ± 1°

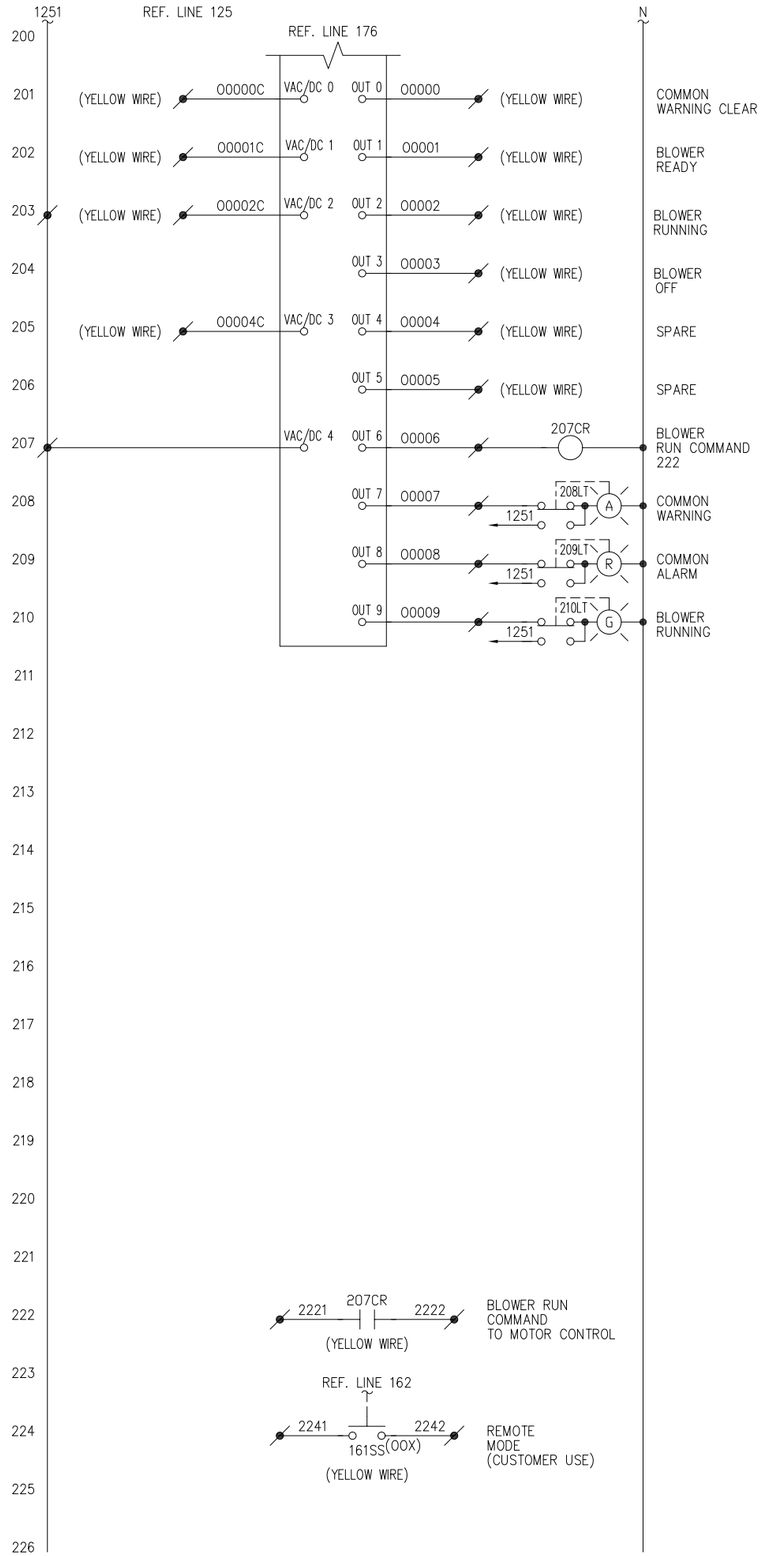
DR. MLB 8-22-03 MET. APP.
CK. DLW 8-22-03 ENG. APP.
SCALE NONE

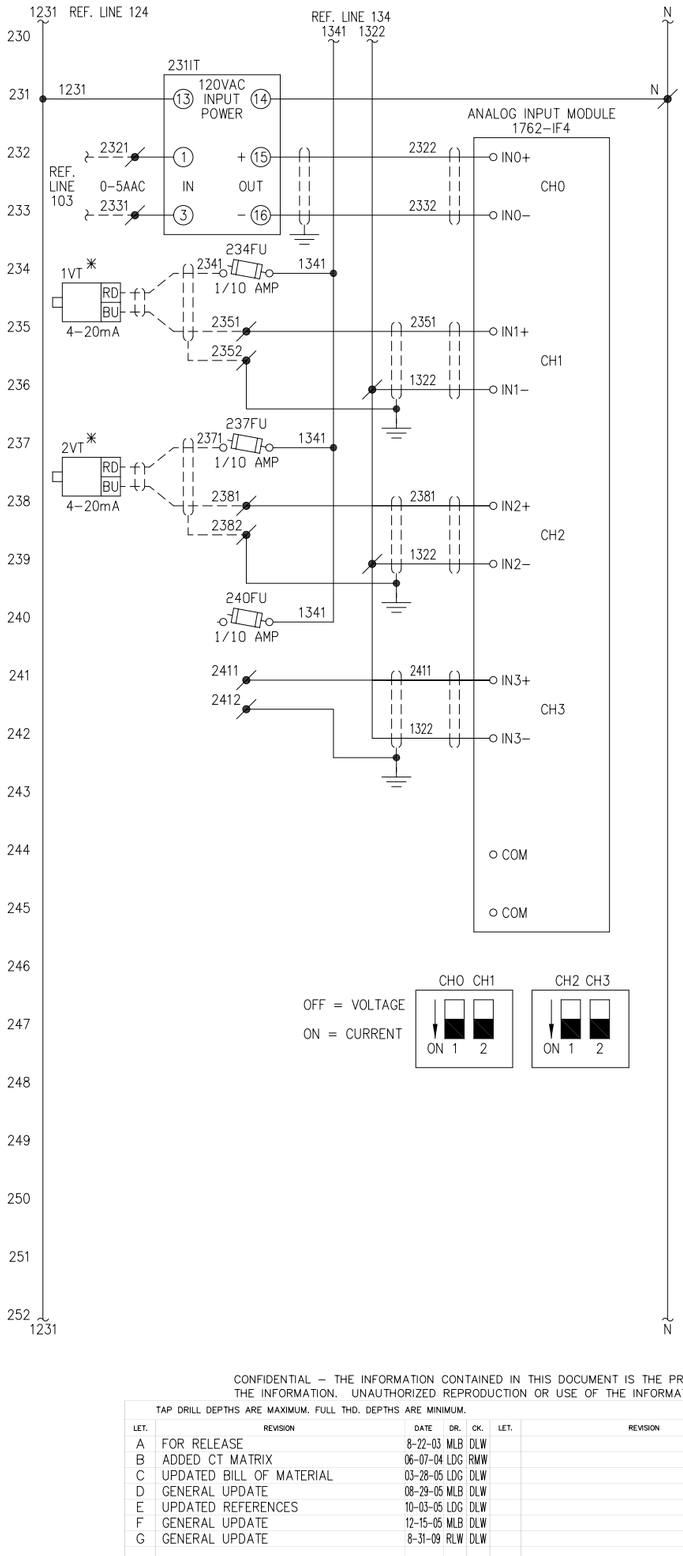
HEAT TREAT SPEC.

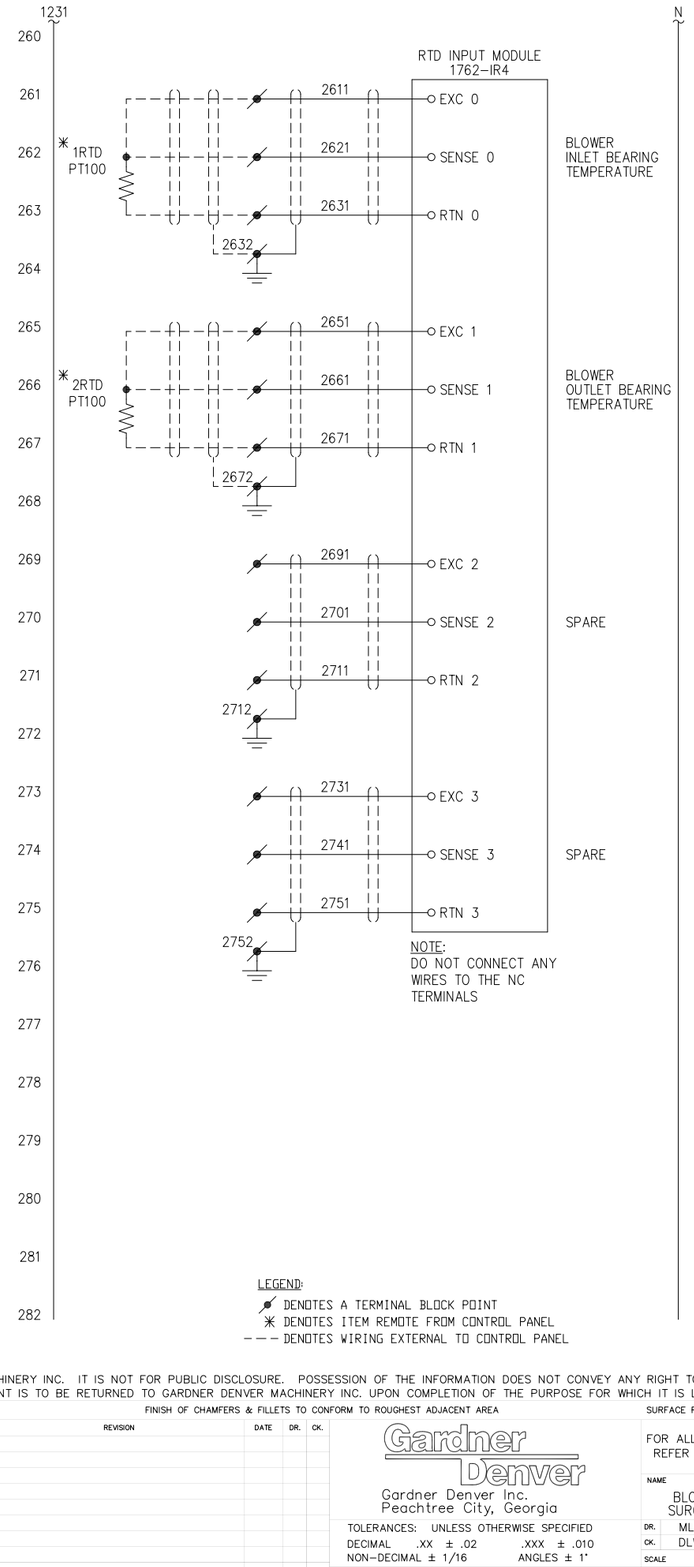
SHEET 1 OF 3

BA1291

RCS: B0471 D CAD FILE: BA129101







LEGEND:
- ✓ DENOTES A TERMINAL BLOCK POINT
- ✳ DENOTES ITEM REMOTE FROM CONTROL PANEL
- – – – DENOTES WIRING EXTERNAL TO CONTROL PANEL

TAP DRILL DEPTHS ARE MAXIMUM. FULL THD. DEPTHS ARE MINIMUM.

FINISH OF CHAMFERS & FILLETS TO CONFORM TO ROUGHEST ADJACENT AREA

SURFACE ROUGHNESS MAX. PER ASA SPEC.

LET.	REVISION	DATE	DR.	CK.
A	FOR RELEASE	8-22-03	MLB	DLW
B	ADDED CT MATRIX	06-07-04	LDG	RMW
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E	UPDATED REFERENCES	10-03-05	LDG	DLW
F	GENERAL UPDATE	12-15-05	MLB	DLW
G	GENERAL UPDATE	8-31-09	RLW	DLW

Gardner Denver

Gardner Denver Inc.
Peachtree City, Georgia

FOR ALL CURRENT SPECIFICATIONS REFER TO BILL OF MATERIAL

NAME: MULTIGARD II BLOWER CONTROL PANEL SURGE/OL, BRG-VIB/TEMP

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL .XX ± .02 .XXX ± .010
NON-DECIMAL ± 1/16 ANGLES ± 1°

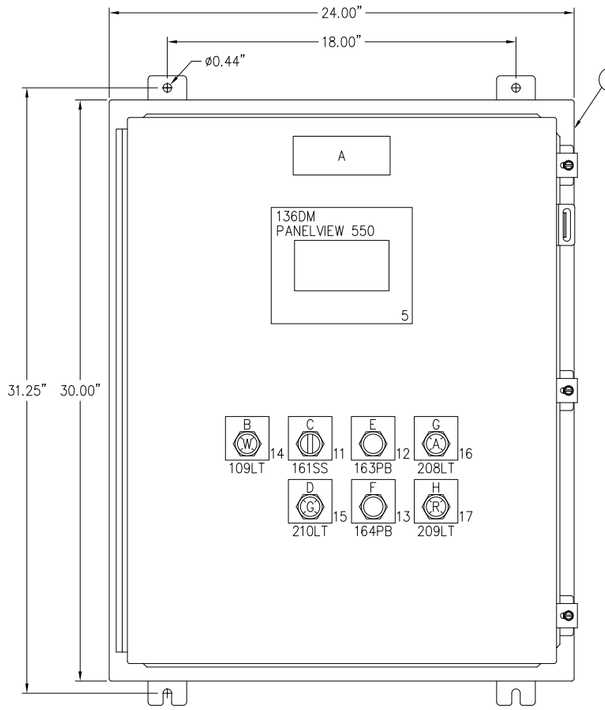
DR.	MLB	8-22-03	MET. APP.
CK.	DLW	8-22-03	ENG. APP.
SCALE	NONE		

HEAT TREAT SPEC.

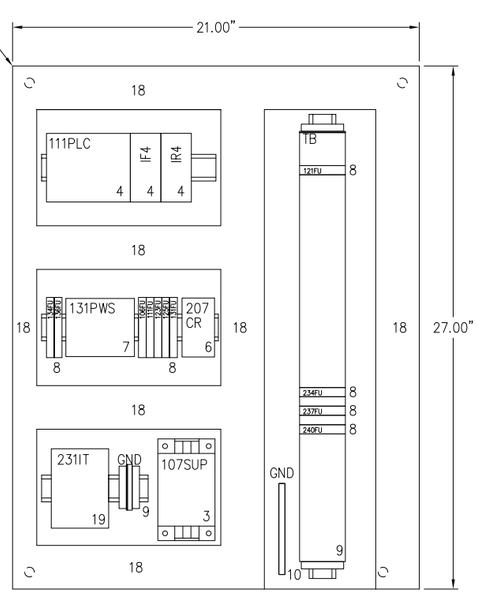
SHEET 2 OF 3

BA1291

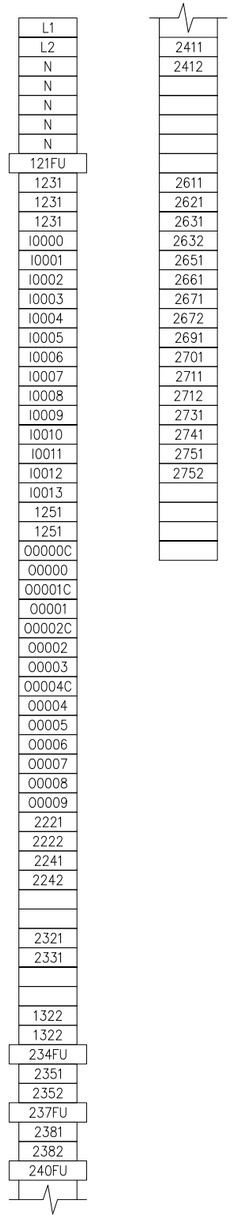
RCS: B0471 D CAD FILE: BA129102



FRONT VIEW
(8" DEEP)



SUBPANEL LAYOUT



TERMINAL BLOCK LAYOUT

NOTE:
1. SELECT CURRENT TRANSFORMER

	CURRENT TRANSFORMER			
	MODEL NUMBER	GDM NUMBER	CATALOG NUMBER	DESCRIPTION
	BA129199	008479310AC□	180SHT-101	CURRENT TRANSFORMER 100:5, 2.5" WINDOW
	BA129198	008479310AB□	180SHT-151	CURRENT TRANSFORMER 150:5, 2.5" WINDOW
	BA129197	008479310AD□	180SHT-201	CURRENT TRANSFORMER 200:5, 2.5" WINDOW
	BA129196	008479310AE□	180SHT-251	CURRENT TRANSFORMER 250:5, 2.5" WINDOW
	BA129195	008479310AF□	180SHT-301	CURRENT TRANSFORMER 300:5, 2.5" WINDOW
	BA129194	008479310AG□	180SHT-401	CURRENT TRANSFORMER 400:5, 2.5" WINDOW
	BA129187	008479310AH□	180SHT-501	CURRENT TRANSFORMER 500:5, 2.5" WINDOW
	BA129186	008479310AJ□	180SHT-601	CURRENT TRANSFORMER 600:5, 2.5" WINDOW

CURRENT TRANSFORMER
MAXIMUM WIRE DISTANCE (FEET)

	CT RATIO					
WIRE SIZE	100:5	150:5	200:5	250:5	300:5	400:5
#14AWG	3	19	68	68	148	310
#12AWG	5	30	105	105	230	480
#10AWG	8	48	169	169	371	774
#8AWG	13	77	269	269	590	1231

RECOMMENDED FIELD WIRING:
120VAC – #14 AWG THHN
24VDC – #14 AWG THHN
VIBRATION SENSORS – 2/C SHIELDED #18 AWG BELDEN 9318 OR EQUAL
RTD SENSORS – 3/C SHIELDED #18 AWG BELDEN 9365 OR EQUAL
CT WIRING – (SEE TABLE FOR AWG) THHN

BILL OF MATERIAL

ITEM	QTY.	GDM PART NO.	MANUFACTURER AND CATALOG NUMBER		DESCRIPTION
1	1		HOFFMAN	A-302408LP	ENCLOSURE, NEMA 12, 30" X 24" X 8"
	1		HOFFMAN	A-30P24	SUBPANEL, 27" X 21", WHITE
2	(NOT USED)				
3	1		EDCO	HSP121BT-1RU	SURGE SUPPRESSOR, 120VAC, WITH FUSE
4	1		ALLEN-BRADLEY	1762-L24AWA	MICROLOGIX 1200 PLC, 14 INPUTS 120V, 10 RELAY OUTPUTS, 85-265VAC POWER
	1		ALLEN-BRADLEY	1762-MM1	MEMORY MODULE
	1		ALLEN-BRADLEY	1762-IF4	ANALOG INPUT MODULE, 4 CHANNELS
	1		ALLEN-BRADLEY	1762-IR4	RTD INPUT MODULE, 4 CHANNELS
5	1		ALLEN-BRADLEY	2711-T5A16L1	PANELVIEW 550, TOUCHSCREEN, RS232(DF1) COMMUNICATION, 24VDC
	1		ALLEN-BRADLEY	1761-CBL-PM02	COMMUNICATION CABLE, RS232(DF1)
	1		COMMERCIAL	COMMERCIAL	NULL MODEM ADAPTER, DB9, MALE - FEMALE
6	1	008351230AJ0	IDEC	RR3B-UL-AC120	CONTROL RELAY, 3PDT, 120VAC, 11-BLADE, W/ IND LIGHT
	1	008449010AD0	IDEC	SR3B-05	RELAY BASE, 11-BLADE
7	1		IDEC	PS5R-D24	POWER SUPPLY, 24VDC, 50 WATT, 2.1 AMP
8	11		WEIDMULLER	1014000000	FUSE TERMINAL BLOCK, WSI 6/2, 1/4" x 1-1/4"
	3		BUSSMANN	MDA 10	FUSE, 10 AMP, 250 VOLT, 1/4" x 1-1/4", TIME-DELAY (2 SPARE)
	4		BUSSMANN	MDL 5	FUSE, 5 AMP, 250 VOLT, 1/4" x 1-1/4", TIME-DELAY (2 SPARE)
	4		BUSSMANN	MDL 1/2	FUSE, 1/2 AMP, 250 VOLT, 1/4" x 1-1/4", TIME-DELAY (2 SPARE)
	3		BUSSMANN	MDL 1	FUSE, 1 AMP, 250 VOLT, 1/4" x 1-1/4", TIME-DELAY (2 SPARE)
	4		BUSSMANN	AGC 1	FUSE, 1 AMP, 250 VOLT, 1/4" x 1-1/4", FAST-ACTING (2 SPARE)
	5		BUSSMANN	AGC 1/10	FUSE, 1/10 AMP, 250 VOLT, 1/4" x 1-1/4", FAST-ACTING (2 SPARE)
9	85		WEIDMULLER	1020100000	TERMINAL BLOCK, WDU4, 600 VAC, 35 AMP, #22 - #10 AWG
10	1		SQUARE D	PK12GTA	GROUND BAR
11	1	009951000AH0	CUTLER-HAMMER	10250T21KB	SELECTOR SWITCH, 3-POS, MAINTAINED, 30mm, 2-N.O.
	1		CUTLER-HAMMER	10250T2	CONTACT BLOCK, 2-N.O.
12	1	009951000AA0	CUTLER-HAMMER	10250T23B	PUSHBUTTON, FLUSH HEAD, BLACK, 1-N.O., 30mm
13	1	009951000AF0	CUTLER-HAMMER	10250T25R	PUSHBUTTON, EXTENDED HEAD, RED, 1-N.C., 30mm
14	1		CUTLER-HAMMER	10250T74NW	PILOT LIGHT, PUSH-TO-TEST, WHITE, 120VAC, 1-N.O., 1-N.C., 30mm
15	1	008414300AS0	CUTLER-HAMMER	10250T74NG	PILOT LIGHT, PUSH-TO-TEST, GREEN, 120VAC, 1-N.O., 1-N.C., 30mm
16	1	008414300AR0	CUTLER-HAMMER	10250T74NA	PILOT LIGHT, PUSH-TO-TEST, AMBER, 120VAC, 1-N.O., 1-N.C., 30mm
17	1	008414300AP0	CUTLER-HAMMER	10250T74NR	PILOT LIGHT, PUSH-TO-TEST, RED, 120VAC, 1-N.O., 1-N.C., 30mm
18	1	009941200AJ0	PANDUIT	TYPE F	WIRE DUCT
19	1	2117961	CROMPTON	253-TALU-LSHG-C6-A5	I/I CURRENT TRANSDUCER, 0-5AAC IN, 4-20mA OUT
△ 20	1	(NOTE 1)	CROMPTON	180SHT-____	CURRENT TRANSFORMER, ____:5, 600 VOLT
△ 21	2	VP1024035	GARDNER DENVER	VP1024035	VIBRATION TRANSDUCER, 1 IN/SEC, 3/8"-24 UNF THREAD X 3/8" LG STUD EXTERNAL THREAD, 1/4" - 20 CONNECTION, WITH 10' CABLE 052BR010BZ
▲ 22	2	300RGA1354	PYROMATION	300RGA1354	RTD, PT100 (385), 100 OHM, 3/4" - 10 BUSHING 316SS

△ SHIPPED LOOSE
▲ GARDNER DENVER SUPPLIED / MOUNTED

ENGRAVING SCHEDULE

ID NO.	QTY.	TYPE	SIZE	PLATE COLOR	LETTER COLOR	FIRST LINE \ SECOND LINE, ETC.
A	1	NP	2" X 5"	WHITE	BLACK	MULTIGARD II \ CONTROL PANEL
B	1	LP	2-1/4" SQ.	WHITE	BLACK	POWER \ ON
C	1	LP	2-1/4" SQ.	WHITE	BLACK	LOCAL OFF REMOTE
D	1	LP	2-1/4" SQ.	WHITE	BLACK	RUNNING
E	1	LP	2-1/4" SQ.	WHITE	BLACK	START
F	1	LP	2-1/4" SQ.	WHITE	BLACK	STOP
G	1	LP	2-1/4" SQ.	WHITE	BLACK	COMMON \ WARNING
H	1	LP	2-1/4" SQ.	WHITE	BLACK	COMMON \ ALARM

NOTE: NAMEPLATES TO BE ATTACHED WITH STAINLESS STEEL SCREWS.

TAP DRILL DEPTHS ARE MAXIMUM. FULL THD. DEPTHS ARE MINIMUM. FINISH OF CHAMFERS & FILLETS TO CONFORM TO ROUGHEST ADJACENT AREA SURFACE ROUGHNESS MAX. PER ASA SPEC.

LET.	REVISION	DATE	DR.	CK.
A	FOR RELEASE	8-22-03	MLB	DLW
B	ADDED CT MATRIX	06-07-04	LDG	RMW
C	UPDATED BILL OF MATERIAL	03-28-05	LDG	DLW
D	GENERAL UPDATE	08-29-05	MLB	DLW
E	UPDATED REFERENCES	10-03-05	LDG	DLW
F	GENERAL UPDATE	12-15-05	MLB	DLW
G	GENERAL UPDATE	8-31-09	RLW	DLW

Gardner Denver
Gardner Denver Inc.
Peachtree City, Georgia

FOR ALL CURRENT SPECIFICATIONS REFER TO BILL OF MATERIAL

NAME MULTIGARD II
BLOWER CONTROL PANEL
SURGE/OL, BRG-VIB/TEMP

TOLERANCES: UNLESS OTHERWISE SPECIFIED
DECIMAL .XX ± .02 .XXX ± .010
NON-DECIMAL ± 1/16 ANGLES ± 1°

DR. MLB 8-22-03 MET. APP.
CK. DLW 8-22-03 ENG. APP.
SCALE 1/4" = 1"

HEAT TREAT SPEC.

SHEET 3 OF 3

BA1291

RCS: B0471 D CAD FILE: BA129103

SPECIFICATIONS

GARDNER DENVER	
MANUFACTURING PROCESS SPECIFICATION	
DOCUMENT NO: MP903	**DOCUMENT VERSION: 17**
TITLE:	**BALANCING – CENTRIFUGAL BLOWER IMPELLERS**

I PURPOSE: The purpose of this specification is to establish the balance requirements for centrifugal blower impellers.

II SCOPE: This specification applies to all centrifugal blower impellers.

III PROCEDURE:

1.0 IMPELLER DETAILS

1.1 REFERENCE FIGURE 1 FOR CAST IMPELLER FEATURES
REFERENCE FIGURE 2 FOR FABRICATED IMPELLERS FEATURES

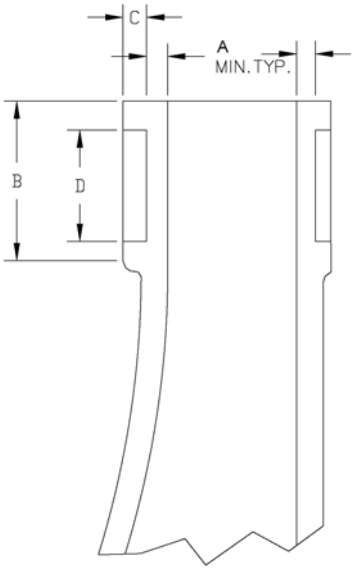


FIGURE 1

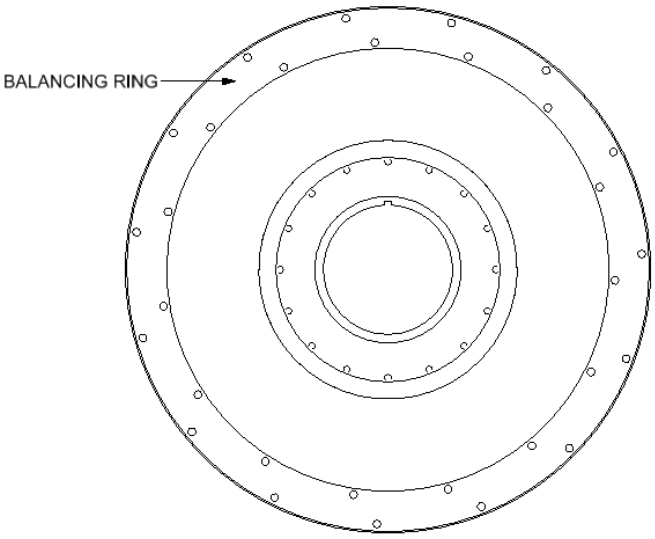


FIGURE 2

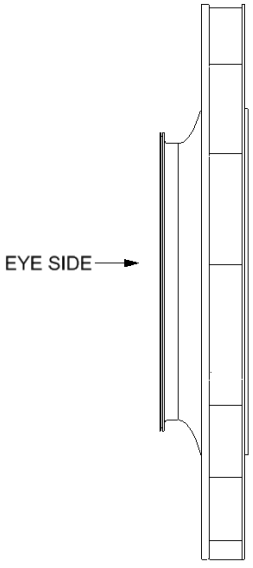


FIGURE 3

GARDNER DENVER	
MANUFACTURING PROCESS SPECIFICATION	
DOCUMENT NO: MP903	**DOCUMENT VERSION: 17**
TITLE:	**BALANCING – CENTRIFUGAL BLOWER IMPELLERS**

2.0 IMPELLER BALANCE REPORTING

2.1 Certified Balance reports shall be supplied for each impeller when required by the purchase order. The balance report shall contain at a minimum the finished machined part number, the ending unbalance, the specified unbalance limit and the date of the balance.

2.2 Each piece meeting the G2.5 tolerance shall be marked or rubber stamped "STATIC BALANCED" with inks suitable for metal surfaces on the side opposite of the eye (as cast, machined, or mill finish). Letters 1" minimum (25mm).

3.0 IMPELLER BALANCE SPECIFICATION & INSTRUCTIONS

3.1 Visually inspect each impeller for porosity, cracks and other notable defects. Contact the Quality Department of Gardner Denver NASH if defects are detected prior to machining the impeller. Failure to acknowledge defects may result in wasted efforts as the impeller may be scrapped. Defects will be labeled as a close gathering of 1/8 inch porosity holes, un-concentric bores, or obvious deviations in material. The balancing workspace should be clean and orderly to aid in repeatability. Remove all burrs.

3.2 CAST IMPELLERS
Balance impellers to G2.5 specification as defined by ISO 1940/1. Refer to “TABLE A” in conjunction with “Figure 1” for maximum drill depth, maximum drill diameter, and maximum allowable unbalance. DO NOT GRIND OR REMOVE MATERIAL FROM ANY AREA OUTSITE OF THE BALANCE RING. Grinding outside of the balancing ring may result in scrap materials.

3.3 FABRICATED IMPELLERS
Balance impellers to G2.5 specification as defined by ISO 1940/1. Impellers are to be balanced by adding weight. DO NOT GRIND IMPELLERS. Add weight to outer radius as defined by Figure 2. Install weights on the exterior surfaces of the impeller. Rivet material is to be the same as the parent material. Rivet heads should not protrude past the lip of the impeller’s outer diameter. DO NOT ALLOW RIVETS TO INTERFER WITH IMPELLER BLADES. “TABLE A” IS NOT VALID FOR FABRICATED IMPELLERS. If hardware is present, mildly tighten the bolts to ensure the hardware cannot shift during the balance process (some impellers have clamping hardware at the hub).

GARDNER DENVER

MANUFACTURING PROCESS SPECIFICATION

DOCUMENT NO: MP903	DOCUMENT VERSION: 17
TITLE:	BALANCING – CENTRIFUGAL BLOWER IMPELLERS

TABLE A

Unit Series	Maximum Initial Unbalance (Gram)	First Side To Balance	Minimum Shroud Thickness "A" (Inches)	Bal.Ring Width (Cast) "B" (Inches)	Maximum Drill Depth "C" (Inches)	Maximum Drill Dia. "D" (Inches)	# Of Bal. Rings	Maximum Allowable Unbalance (Gram)
Turbotron	N/A	O.D.	N/A	N/A	.875	.375	N/A	0.67
200	N/A	Opp. Eye Side	.062	1.125	.062	1.0	1	0.10
250	N/A	Opp. Eye Side	.075	1.125	.075	1.0	1	0.19
310	45	Opp. Eye Side	1/8	1.0	1/16	.875	1	0.25
400	60	Opp. Eye Side	1/8	1.25	1/8	1.125	1	0.32
510	70	Opp. Eye Side	1/8	1.25	3/16	1.125	1	0.45
550	70	Opp. Eye Side	1/8	1.25	3/16	1.125	1	0.45
600	100	Opp. Eye Side	1/8	1.5	3/16	1.375	1	0.55
650	170	Eye Side	1/8	1.5	1/8	1.375	2	0.52
810/850	125	Opp. Eye Side	1/8	1.5	1/8	1.375	1	0.60
860	175	Opp. Eye Side	1/8	1.25	1/8	1.125	1	0.84
870	175	Eye Side	1/8	1.25	1/4	1.125	1	0.64
1210/1250	150	Eye Side	1/8	1.25	3/16	1.125	2	0.85
1260	150	Eye Side	1/8	1.25	3/16	1.125	2	0.79
1270	150	Eye Side	1/8	1.3	3/16	1.125	2	0.85
1400	200	Eye Side	1/8	1.5	3/16	1.375	2	0.88
1600	200	Eye Side	1/8	1.3	1/4	1.125	2	1.06
1800	275	Eye Side	3/16	1.5	1/4	1.375	1	0.98
1850	275	Eye Side	1/8	1.5	1/4	1.375	2	1.00
1870	275	Eye Side	1/8	1.5	1/8	1.375	2	1.03
2000	275	Eye Side	1/8	1.5	1/4	1.375	2	1.21
2400	275	Eye Side	1/4	1.4	1/4	1.265	1	1.75
40	60	N/A	1/16	N/A	1/16	N/A	N/A	0.22
41	60	N/A	1/16	N/A	1/16	0.875	N/A	0.30
42	70	Opp. Eye Side	1/4	1.0	1/4	0.875	1	0.51
642	70	Opp. Eye Side	1/8	1.0	1/8	0.875	1	0.54
725	70	Eye Side	1/8	1.0	3/32	0.875	2	0.22
383-22"	100	Opp. Eye Side	1/8	1.0	1/8	0.875	1	0.46
383-24"	100	Opp. Eye Side	1/8	1.0	1/8	0.875	1	0.55
732	170	Eye Side	1/8	1.0	1/8	0.875	2	0.51

GARDNER DENVER

MANUFACTURING PROCESS SPECIFICATION

DOCUMENT NO: MP903	DOCUMENT VERSION: 17
TITLE:	BALANCING – CENTRIFUGAL BLOWER IMPELLERS

Unit Series	Maximum Initial Unbalance (Gram)	First Side To Balance	Minimum Shroud Thickness "A" (Inches)	Bal.Ring Width (Cast) "B" (Inches)	Maximum Drill Depth "C" (Inches)	Maximum Drill Dia. "D" (Inches)	# Of Bal. Rings	Maximum Allowable Unbalance (Gram)
741/384	170	Opp. Eye Side	1/8	1.75	1/8	0.875	1	0.63
742	170	Eye Side	1/8	1.0	1/8	0.875	2	0.55
652	170	Eye Side	1/8	1.25	1/8	0.875	2	0.69
751/385	170	Eye Side	1/8	1.25	3/16	0.875	2	0.75
752	140	Eye Side	1/8	.875	1/8	0.875	2	0.78
761	200	Eye Side	3/16	1.5	1/8	0.875	2	1.19
772	200	Eye Side	N/A	N/A	N/A	N/A	2	0.64
791	200	N/A	N/A	N/A	N/A	N/A	N/A	0.97
691	200	N/A	N/A	N/A	N/A	N/A	N/A	1.40
671	200	Eye Side	3/16	1.5	1/8	1.375	2	1.32
300/400X/600	N/A	N/A	.035	N/A	.035	0.136	N/A	0.014 oz.-in
400	N/A	N/A	.035	N/A	.035	0.180	N/A	0.022 oz.-in
4000	N/A	N/A	.035	N/A	.035	0.180	N/A	0.021 oz.-in
TIR-1XX	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.041 oz.-in
TIR-2XX	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.057 oz.-in
TIR-3XX	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.081 oz.-in
TIR-4XX	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.089 oz.-in
T1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.055 oz.-in
T2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.077 oz.-in
T3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.086 oz.-in
940	200	Opp. Eye Side	1/8	1.5	7/32	1.375	2	0.53
950	200	Eye Side	1/8	1.5	1/4	1.375	1	0.75
960	275	Eye Side	1/8	1.5	1/4	1.375	1	1.24

IV. APPROVAL

David Friedman
Development Engineer III

GARDNER DENVER

MANUFACTURING PROCESS SPECIFICATION

DOCUMENT NO: MP903	DOCUMENT VERSION: 17
TITLE:	BALANCING – CENTRIFUGAL BLOWER IMPELLERS

CHG. NO.	DESCRIPTION	VER.	DATE
1006910	SHEET RELEASED	00	02/24/00
1007033	Revised Section 7.0 and Table A (changed number of Balance rings on the 1800 10oz and the 2400 13oz from 2 to 1	01	03/10/00
1008774	Added Sections 9.0 and 9.1	02	10/30/00
1015369	Added Hoffman units (40-691)	03	02/14/03
1016261	Removed procedure referenced SOE#220, added Maximum Initial Unbalance for Hoffman units	04	05/13/03
1020906	Added lines to Table A	05	06/07/04
1022058	Unbalance limits updated per ISO 1940, Grade G6.3	06	09/02/04
1027266	7500 (Invincible) impeller added	07	09/06/05
1027395	Deleted product series references from "Scope"	08	09/07/05
1034212	7500 unit series removed from table	09	01/16/07
1039278	Revise Table A, add Figure 1 for cast impellers	10	01/18/08
1044723	Add 384 to 741, add 385 to 751	11	02/09/09
1054157	Add Section III.2.2 for identification	12	09/10/10
1074932	Add Fabricated Impeller specifications	13	04/05/13
1080907	Corrected tabulated data. Further defined fabricated impellers. Unbalance limits adjusted to G2.5	14	10/23/13
1084754	Updated minimum shroud thickness for 1600series impeller from 3/8” to 1/8” Corrected 1400 tabulated drill depth	15	7/10/14
1086612	Revised for SAP Object Links	16	9/23/14
1098780	Added 940, 950, 960 series data	17	3/8/2016

GARDNER DENVER
PRODUCT TEST SPECIFICATION

DOCUMENT NO: PT 9016 **DOCUMENT VERSION: 16**

Title: CENTRIFUGAL BLOWER MECHANICAL TEST

I PURPOSE

To establish procedures and responsibilities for final acceptance checking, including mechanical run testing of Cast Iron, Fabricated, Turbotron and Single Stage assemblies to ensure they meet engineering, contractual and functional test requirements prior to shipment.

II SCOPE

This procedure applies to complete packages or bare unit assemblies manufactured within the Peachtree City facility. This procedure covers all Centrifugal Blowers including Cast Iron, Fabricated, Turbotron and Single Stage units.

III PROCEDURE

1.0 MECHANICAL RUN TEST

Perform a visual inspection on the blower to confirm the following:

- Was the Blower assembled to specifications/order?
- Is Coupling or V-belt alignment satisfactory?
- Are all fasteners secure?

1.1 ***ALL ASSOCIATES MUST FOLLOW STANDARD LOCK/OUT TAG/OUT PROCEDURES WHEN WORKING AROUND ELECTRICAL POWER SOURCES***. Connect motor/driver to correct power source and insulate properly. Check blower for proper rotation by turning the motor/driver on and off quickly. Once the blower has stopped rotating, reverse connections if necessary to obtain proper rotation.

1.2 Close off the inlet (suction) connection of the blower with a throttling device (valve, metal plate, etc.). NOTE: Does not apply to Turbotron/Mapro or Single Stage.

1.3 Start motor/driver. When the blower reaches full operating speed, if a throttling device was used, open the inlet-throttling device slowly until the blower begins to run smoothly outside of the surge region. Surge may be detected by an audible air pumping sound. Run the blower in this configuration for a period of time not less than the figure found in Table A, the Mechanical Run Test Specification Sheet, for the applicable blower size. This will assure stabilized temperature readings.

1.4 During this stabilization period, the following areas should be observed:

a. Listen for internal rubs or obvious discrepancies.
b. Check shaft seals for detectable leaks or overheating. NOTE: Carbon ring seals are prone to overheating during break-in. If a high temperature excursion occurs, shut down the blower and allow it to cool. Restart the blower and continue with the test.
c. Check blower and motor bearings for abnormal noise or overheating.
d. Check blower bearing housings for excessive vibration.
e. If the unit is a belt drive unit, the blower RPM must be verified by placing a piece of reflective tape on the blower drive coupling and use of a phototachometer to verify that the speed is within +/- 2%.

1.5 If any observation reveals unsatisfactory or questionable operation, shut the blower down and notify the Team Leader for corrective action.

1.6 At completion of stabilization period, repeat the observations listed in 1.4, and measure vibration and temperature as described below:

Single Stage:

a. Output gear vibration in inches/sec (vertical).
b. Output gear vibration in inches/sec (horizontal).
c. Input gear vibration in inches/sec (vertical).
d. Output gear temperature in degrees F.
e. Input gear temperature in degrees F.

All other models:

a. Inlet vibration in inches/sec or mils pk-pk (vertical and horizontal).
b. Outlet vibration in inches/sec or mils pk-pk(vertical and horizontal).
c. Axial vibration in inches/sec or mils pk-pk (both ends).
d. Inlet bearing housing temperature in degrees F.
e. Outlet bearing housing temperature in degrees F.

Acceptable vibration and bearing temperature readings are defined in Table A, the Mechanical Run Test Specification Sheet. If any observation reveals unsatisfactory or questionable operation, shut the blower down and notify the Team Leader for corrective action.

1.7 With acceptable readings at stabilization, continue to run the

blower at the same throttle setting for the Test Duration as outlined in Table A, the Mechanical Run Test Specification Sheet.

1.8 At the completion of the required test duration, repeat the readings listed in 1.6 and record the results in the e-test database and on the Blower Assembly Inspection Report.

1.9 Disconnect unit at the completion of the Mechanical Run Test and stamp the serial number of the accepted unit on the outside of the inlet head flange at the 2 o'clock position facing the drive end shaft.

2.0 MECHANICAL RUN TEST RECORDS

2.1 A record of the mechanical run test shall be maintained using the e-test database.

3.0 TEST STATUS

3.1 The test status of products that have completed Mechanical Run Test shall be clearly identified as tested complete on the Blower Assembly Inspection Report. The associate that performed the test shall log the date, employee number and measurement results in the spaces provided.

3.2 Products that fail to meet the acceptance criteria in Table A, the Mechanical Run Test Specification Sheet, and cannot be repaired on the test pad are considered a failure in the e-test database. The Team Leader should be notified to initiate corrective action.

4.0 CERTIFIED TESTING

4.1 Testing which requires certification shall be conducted under the surveillance of a member of Quality Engineering.

Vibration Cross Reference Chart						
Level	**Units**		**Level**	**Units**	**Frequency**	**Speed**
1.25	mils pk-pk	CONVERT TO	0.236	in/sec Peak	60HZ	3600
1.25	mils pk-pk		0.163	g RMS	60HZ	3600
3	mils pk-pk		0.566	in/sec Peak	60HZ	3600
3	mils pk-pk		0.391	g RMS	60HZ	3600
0.236	in/sec Peak		1.25	mils pk-pk	60HZ	3600
0.236	in/sec Peak		0.163	g RMS	60HZ	3600
0.566	in/sec Peak		3	mils pk-pk	60HZ	3600
0.566	in/sec Peak		0.391	g RMS	60HZ	3600
0.163	g RMS		1.25	mils pk-pk	60HZ	3600
0.163	g RMS		0.236	in/sec Peak	60HZ	3600
0.391	g RMS		3	mils pk-pk	60HZ	3600
0.391	g RMS		0.566	in/sec Peak	60HZ	3600

TABLE A
GARDNER DENVER
MECHANICAL RUN TEST SPECIFICATION SHEET

Test Duration				Vibration (Vertical/ Horizonal/Axial inches/sec)		Brg. Temp Inlet	Brg. Temp Outlet
(Minutes)				(Max.)		(Max.)	(Max.)
Model Series	**Stabilize Time**	**Min. Run Time**	**Total Test Time**	**Direct Drive at 3600 RPM**	**Belt Drive**	**Degrees F @ 70 Amb**	**Degrees F @ 70 Amb**
Turbotron/ Mapro	20	40	60	0.235	0.57	180	200
Fabricated Lamson PST, TST,TFT	20	60	80	0.37	0.57	180	200
AFW3000 AFW4000 Producers	15	45	60	---	0.57	180	200
Hoffman T-SERIES (T1A,T2B,T3A)	20	60	80	0.235	0.57	180	200
T2B07,T2B08	20	60	80	0.37	0.57	180	200
SS 7000	20	40	60	0.235	N/A	180	200
SS 7500	20	40	60	0.235	N/A	180	200
SS 9000	20	40	60	0.235	N/A	180	200
202	20	30	50	0.235	0.57	180	200
211-213	20	30	50	0.235	0.57	180	200
251-255	20	30	50	0.235	0.57	180	200
261-265	20	30	50	0.235	0.57	180	200
3101-3111	20	30	50	0.235	0.57	180	200
401-404	20	30	50	0.235	0.57	180	200
511-512	20	30	50	0.235	0.57	180	200
551-552	20	30	50	0.235	0.57	180	200
405-410	30	45	75	0.235	0.57	180	200
513-515	30	45	75	0.235	0.57	180	200
553-555	30	45	75	0.235	0.57	180	200
601-603	30	45	75	0.235	0.57	180	200
651-653	30	45	75	0.235	0.57	180	200
516-5110	45	60	105	0.235	0.57	180	200
556-5510	45	60	105	0.235	0.57	180	200
604-609	45	60	105	0.235	0.57	180	200
654-659	45	60	105	0.235	0.57	180	200
811-813	45	60	105	0.235	0.57	180	200

GARDNER DENVER
PRODUCT TEST SPECIFICATION

DOCUMENT NO: PT 9016 **DOCUMENT VERSION: 16**

Title: CENTRIFUGAL BLOWER MECHANICAL TEST

Test Duration				Vibration (Vertical/ Horizonal/Axial inches/sec)		Brg. Temp Inlet	Brg. Temp Outlet
(Minutes)				(Max.)		(Max.)	(Max.)
Model Series	Stabilize Time	Min. Run Time	Total Test Time	Direct Drive at 3600 RPM	Belt Drive	Degrees F @ 70 Amb	Degrees F @ 70 Amb
851-853	45	60	105	0.235	0.57	180	200
861-863	45	60	105	0.235	0.57	180	200
871-873	45	60	105	0.235	0.57	180	200
814-819	45	75	120	0.235	N/A	180	200
854-859	45	75	120	0.235	N/A	180	200
864-8610	45	75	120	0.235	N/A	180	200
874-8710	45	75	120	0.235	N/A	180	200
1212-1213	45	75	120	0.235	N/A	180	200
1251-1253	45	75	120	0.235	N/A	180	200
1214-1216	60	90	150	0.235	N/A	180	200
1254-1257	60	90	150	0.235	N/A	180	200
1261-1268	60	90	150	0.235	N/A	180	200
1271-1279	60	90	150	0.235	N/A	180	200
1401-1408	60	90	150	0.235	N/A	180	200
1601-1608	60	90	150	0.235	N/A	180	200
1801-1807	60	90	150	0.235	N/A	180	200
1851-1857	60	90	150	0.235	N/A	180	200
1871-1877	60	90	150	0.235	N/A	180	200
2001-2008	60	90	150	0.235	N/A	180	200
2401-2406	60	90	150	0.235	N/A	180	200
37701-37705	20	40	60	0.235	0.57	180	200
38301-38305	20	40	60	0.235	0.57	180	200
38306-38309	45	75	120	0.235	0.57	180	200
38401-38405	20	40	60	0.235	0.57	180	200
38406-38409	45	75	120	0.235	0.57	180	200
38501-38503	20	40	60	0.235	0.57	180	200
38504-38506	45	75	120	0.235	0.57	180	200
38601-38603	20	40	60	0.235	0.57	180	200
38604-38606	45	75	120	0.235	0.57	180	200
40501-40510	20	40	60	0.235	0.57	180	200
4001-4005	20	40	60	0.235	0.57	180	200
4006-4010	30	60	90	0.235	0.57	180	200
4101-4105	20	40	60	0.235	0.57	180	200
4106-4110	45	75	90	0.235	0.57	180	200
4201-4204	20	40	60	0.235	0.57	180	200
4205-4208	45	75	120	0.235	0.57	180	200

GARDNER DENVER
PRODUCT TEST SPECIFICATION

DOCUMENT NO: PT 9016 **DOCUMENT VERSION: 16**

Title: CENTRIFUGAL BLOWER MECHANICAL TEST

Test Duration				Vibration (Vertical/ Horizonal/Axial inches/sec)		Brg. Temp Inlet	Brg. Temp Outlet
(Minutes)				(Max.)		(Max.)	(Max.)
Model Series	Stabilize Time	Min. Run Time	Total Test Time	Direct Drive at 3600 RPM	Belt Drive	Degrees F @ 70 Amb	Degrees F @ 70 Amb
64201-64205	20	40	60	0.235	0.57	180	200
64206-64210	45	75	120	0.235	0.57	180	200
65101-65103	20	40	60	0.235	0.57	180	200
65104-65108	45	75	120	0.235	0.57	180	200
67101-67105	45	75	120	0.235	0.57	180	200
67106-67107	60	90	150	0.235	0.57	180	200
69101-69104	60	90	150	0.235	0.57	180	200
74101-74105	20	40	60	0.235	0.57	180	200
74106-74109	45	75	120	0.235	0.57	180	200
75101-75103	20	40	60	0.235	0.57	180	200
75104-75107	45	75	120	0.235	0.57	180	200
76101-76103	20	40	60	0.235	0.57	180	200
76104-76107	45	75	120	0.235	0.57	180	200
77201-77203	20	40	60	0.235	0.57	180	200
77204-77207	45	75	120	0.235	0.57	180	200
78101-78102	30	60	90	0.235	0.57	180	200
78103-78106	45	75	120	0.235	0.57	180	200
79101-79102	45	75	120	0.235	0.57	180	200
79103-79105	60	90	150	0.235	0.57	180	200
72501-72503	30	60	90	0.235	0.57	180	200
72504-72507	60	90	150	0.235	0.57	180	200
73201-73207	20	40	60	0.235	0.57	180	200
73208-73210	60	90	120	0.235	0.57	180	200
74201-74206	20	40	60	0.235	0.57	180	200
74207-74209	45	75	120	0.235	0.57	180	200
74210-74211	60	90	150	0.235	0.57	180	200
75201-75203	20	40	60	0.235	0.57	180	200
75204-75206	45	75	120	0.235	0.57	180	200
75207-75210	60	90	150	0.235	0.57	180	200

V. APPROVAL

Dan Spencer
PTC Engineering

GARDNER DENVER
PRODUCT TEST SPECIFICATION

DOCUMENT NO: PT 9016 **DOCUMENT VERSION: 16**

Title: CENTRIFUGAL BLOWER MECHANICAL TEST

CHG. NO.	DESCRIPTION	VER.	DATE
Various	See SAP History for previous revision descriptions	00-14	------
1053055	Add 551-552 Series to Table A; SAP C/M history page added.	15	07/15/10
1059299	Add "TFT" on page 5 under "Fabricated Lamson PST, TST"; change "Section V – Approval" to Dan Spencer	16	04/19/11

CERTIFICATES
&
REPORTS

Gardner Denver Nash
200 Simko Blvd, Charleroi PA 15022
HM4BU\CAB820 R802.02439 AHF1728

SCHENCK

Balancing report

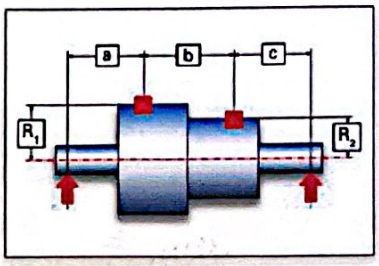
User	City of everett
Order number	5150126-P025537

Type data

Rotor type	ro test 1 23*
Last change	1/23/2023 7:31 AM
Set speed	700 rpm

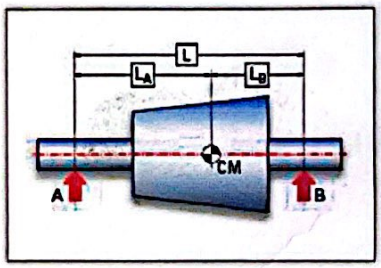
ABC geometry

Position of correction planes	
Distance a	9.000 inch
Distance b	25.000 inch
Distance c	5.000 inch
Radius 1	12.000 inch
Radius 2	12.000 inch



ISO 1940-1:2003 calculation

Calculation based on	Quality grade G	
Deviation (+/-)%	0	
Balancing quality grade	G 0,4	
mass of rotor	308 pound	
Service speed	3600 rpm	
Dynamic Tolerance 1	2.92	g·in
Dynamic Tolerance 2	2.92	g·in



Measuring Results, Run: 1

1/23/2023

Rotor ID	1265-ADOI		
Measuring speed	637 rpm		
Correction			
Correction Plane 1 - Mass (Remove)	3.52 g	47 °	14.5 * Tol
Correction Plane 2 - Mass (Remove)	5.05 g	31 °	20.8 * Tol

Rotor out of tolerance

Measuring Results, Run: 21

1/23/2023

Rotor ID	1265-ADOI		
Measuring speed	637 rpm		
Correction			
Correction Plane 1 - Mass (Remove)	0.0704 g	233 °	in Tol
Correction Plane 2 - Mass (Remove)	0.142 g	215 °	in Tol

Rotor in tolerance

Date Signature Stamp

Gardner Denver

BLOWER ASSEMBLY REPORT - Testing

NUS-OH-MF04-CF-BAR
Rev 21

Customer: City Of everett | SO# / PO# 5150126

MATERIAL / MODEL 1265-ADOI Package | Unit 1 of 1 | Serial No.: P025537

Blower / Exhauster | Air / Gas | Inlet / Outlet Driven

Operation/Testing/Assembly	Details	Date (mm/dd)	Completed By (clock#)
ALIGNMENT			
1. Plumbing installation:	PLUGS DRAINS	1/24	33281
2. Drive:	DIRECT BELT OVERHUNG		
3. Laser Alignment:	YES NO		
HOR: Angle ____ Offset ____ VERT: Angle ____ Offset ____			
4. Torque: Blower bolts ____ Motor bolts ____		1/24	33281
5. No bolt binding on blower-motor alignment. No soft foot. No loose shims			
HYDRO TEST		(mm/dd)	(clock#)
1. Hydro Press Test:	YES NO	__/__	____
____ psig ____ minutes Patches:	YES NO	__/__	____ QA
Note: HYDRO Test Criteria per specification MP911			
MECHANICAL RUN TEST		(mm/dd)	(clock#)
1. Motor:	TEST MOTOR JOB MOTOR	1/24	33281
2. Motor S/N MTR-5	Motor HP 400		
3. Motor Manuf. ____ Encl DP	Frame Size 447TSS S/F 1.15		
4. Volts 460 Amps 445	PH 3 HZ 60	1/24	33281
5. Mechanical Run Test Time: 150 minutes (total test time)			
Blower RPM actual: 3579	Motor RPM actual: 3570		
Vibration data - INLET: V: .10 H: .05	A: .08 IPS		
Vibration data - OUTLET: V: .06 H: .03	A: .07 IPS		
Ambient Temp: 68.5 °F			
Bearing Temp: Inlet: 126° °F	Outlet: 170.5 °F	1/24	33281
6. Lubrication *	OIL GREASE		
*If Oil machine, drain andre-install plugs per SOE - 206 SOE_CF Mechanical Run Test			
Note: Mechanical Test Criteria per specification PT9016			
PERFORMANCE TEST		(mm/dd)	(clock#)
1. ASME Performance Test (Forward results)	YES NO	__/__	____
Test #: ____			
Test Lab Engineer or designee sign-off required for performance acceptance:		__/__	____ Eng
OTHER TEST(S)		(mm/dd)	(clock#)
1. Leak Test - Carb Ring Seal	YES NO		
INLET Act Flow ____ CFM/CFH	Seal Press ____ psig	__/__	____
OUTLET Act Flow ____ CFM/CFH	Seal Press ____ psig	__/__	____ QA
2. Gas Press Test:	YES NO	__/__	____
____ psig ____ minute	Patches: YES / NO	__/__	____ QA
3. Sound Level Test (Forward results)	YES NO	__/__	____
4. Vibration Signature Analysis Test (Forward results)	YES NO	__/__	____
Sound Level Test Criteria per specification PT9015, Vibration Signature Analysis Test Criteria per specificaton PT9013			

Gardner Denver

200 Simko Blvd. Charleroi, Pennsylvania 15022

SOLD TO

CUSTOMER NAME:

SALES ORDER:

MODEL NUMBER:

SERIAL NUMBER:

ORDER REQUIREMENTS

PRODUCTION LINE: CF

UNIT TYPE:

APPLICATION TYPE:

DRIVE POSITION:

DRIVER TYPE:

INLET POSITION:

OUTLET POSITION:

SEAL TYPE: AIR / LUBRICATION

LUBRICATION TYPE:

PAINT MANUFACTURER: Sherwin Williams

BLOWER PAINT COLOR: RAL 5005

CPLG GUARD PAINT COLOR:

PROBE INTERFACE:

SKID WIRING:

BASE TYPE:

MACHINED PADS:

IMPELLER MIX

IMPELLER TYPE 1:	QUANTITY 1:
IMPELLER TYPE 2:	QUANTITY 2:
IMPELLER TYPE 3:	QUANTITY 3:

TURBOTRON FLOW:

TURBOTRON DIRECTION:

JOB MOTOR DATA

MOTOR MANUFACTURER:

MOTOR SERIAL NUMBER:

HORSEPOWER:

MOTOR RPM:

ENCLOSURE TYPE:

FRAME SIZE:

VOLTAGE: VOLTS

FULL LOAD AMPS: AMPS

SERVICE FACTOR:

PHASE:

HZ:

MOTOR USED FOR TEST: ☐ JOB MOTOR ☐ TEST MOTOR

TEST MOTOR DATA

HORSEPOWER:

VOLTAGE:

FULL LOAD AMPS:

RPM:

MECHANICAL TEST / INSPECTION

TEST CRITERIA

VIBRATION LIMIT (,=3600 RPM) 0.235 In/Sec Pk

VIBRATION LIMIT (>3600 RPM) In/Sec Pk

MAX. BEARING TEMPERATURE: 200 °F

TESTED BY

ASSOCIATE NO:

TEST DATE:

TEST RESULTS

INLET BEARING VIBRATION V:	In/Sec Pk	OUTLET BEARING VIBRATION V:	In/Sec Pk	INLET BRNG TEMP:	Deg. F
INLET BEARING VIBRATION H:	In/Sec Pk	OUTLET BEARING VIBRATION H:	In/Sec Pk	OUTLET BRNG TEMP:	Deg. F
INLET BEARING VIBRATION A:	In/Sec Pk	OUTLET BEARING VIBRATION A:	In/Sec Pk	BLOWER RPM:	

Vibration Conversion: Velocity (in/sec Pk) = (Frequency/318)*Displacement (mils Pk-Pk)

	START TIME	STOP TIME	TOTAL TIME	
BLOWER MECHANICAL TEST TIME:				MINUTES

INSTALLATION
&
OPERATING
INSTRUCTIONS

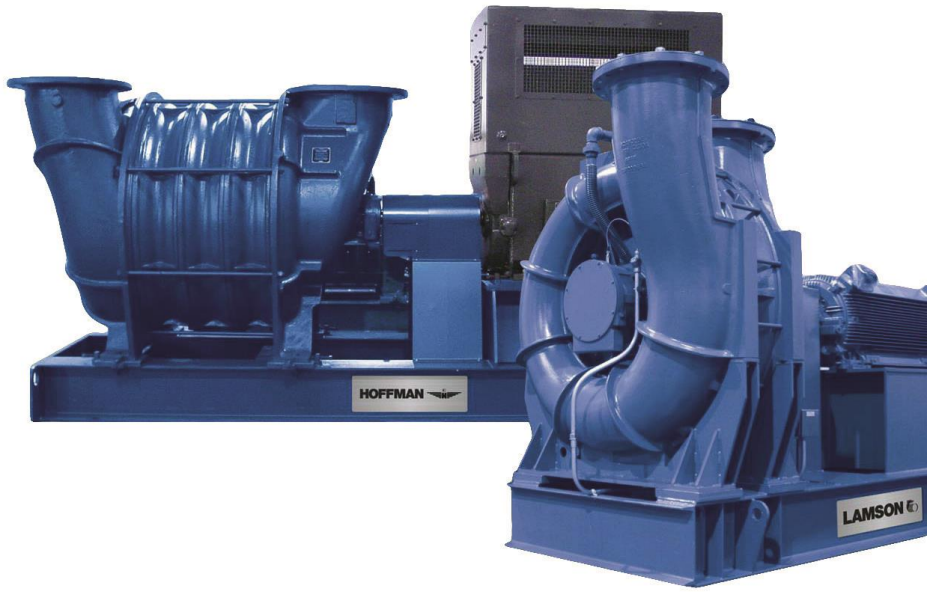
Maintenance Procedures

The individual operating instruction manuals included in this O&M provide guidance for routine procedures that can be completed by the equipment owner. Disassembly instructions are not included for the motor/blower because any work of this nature should be completed by an authorized Gardner Denver technician or an authorized motor shop.

HOFFMAN LAMSON
by Gardner Denver

Multistage Centrifugal Blower

Original Operating Manual



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We reserve the right to make technical changes.
Read carefully before use.
Save for future use.

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1 About this document

This manual:

- is part of the machine
- applies to all types noted on the bottom of the page (Chapter 1.3, Page 6)
- describes safe and appropriate operation during all operating phases

1.1 Target groups

Target group	Duty
Operating company	▶ Keep this manual accessible at the site of operation of the equipment, including for later use. ▶ Make sure that personnel read and follow the instructions in this manual and the other applicable documents, especially the safety instructions and warnings. ▶ Observe any additional rules and regulations that relate to the system. ▶ Assign only qualified personnel to work with the machine.
Qualified personnel, fitter	▶ Read, observe, and follow this manual and the other applicable documents, especially all safety instructions and warnings.

Table 1 Target groups and their duties

1.2 Other applicable documents

Document	Purpose
Spare parts list	Ordering spare parts
ATEX supplementary operating manual	Notes on use in explosion-hazard areas
Supplementary operating manual for components included in scope of delivery	• e.g. motor, coupling, control systems • Instructions for handling the laser alignment device and the design data sheet for the specific machine
Technical data sheet	Dimensions, declaration of weight and power curves
Machine-specific construction sheet	Ensuring operation

Table 2 Other applicable documents and their purpose

1.3 Area of validity

This manual applies to the following models:

- Catalog models: 42, 260, 310, 400, 510, 550, 732, 741, 742, 751, 752, 761, 850, 870, 1260, 1270, 1400, 1600, 1870, 2000, 2400, 930, 940, 950 and 960
- Non-catalog models: 40, 41, 250, 671, and 810
- Fabricated Models: T1, T2, and T3 series

1.4 Warnings and symbols

Warning	Risk level	Consequences of disregard
⚠ DANGER	Immediate acute risk	Death, serious bodily harm
⚠ WARNING	Potential acute risk	Death, serious bodily harm
⚠ CAUTION	Potentially hazardous situation	Minor bodily harm
NOTE	Potentially hazardous situation	Material damage

Table 3 Warnings and consequences of disregarding them

Symbol	Meaning
	Safety warning sign ▶ Take note of all information highlighted by the safety warning sign and follow the instructions to avoid injury or death.
▶	Instruction
1. , 2. , etc.	Multiple-step instructions
✓	Requirement
→	Cross reference
	Information, advice

Table 4 Symbols and their meaning

1.5 Technical terms

Term	Meaning
Test pressure also: – Testing pressure	Pressure applied to the machine during leak test.
Unit	Assembly comprised of machine and drive motor.
Intake pressure	Pressure of the gases/vapors to be charged at the machine's inlet port.
Drive end also: – D-side – DE (drive end)	End of the machine to which the drive is connected
Outlet pressure/ Discharge perssure	Pressure of the gases/vapors to be charged at the machine's outlet port; discharge pressure.
Blower/exhauster	Machine for generating vacuum (exhauster) or pressure (compressor)
Qualified personnel	Persons who, due to their training, experience and instruction, as well as their knowledge of applicable standards, regulations, accident-prevention provisions, and work environment, are capable of performing certain tasks (e.g. commissioning, operation, maintenance, repair) and who, in doing so, are capable of identifying and avoiding hazards. This includes knowledge of first aid and of the local emergency facilities. Such persons must receive explicit authorization for performing the respectively required tasks from the party responsible for safe operation of the system.
Machine	In this context: the blower. Assembly that takes in, delivers, and compresses gases and/or vapors as well as generates vacuum or overpressure. The drive is not considered part of the machine in this respect.
Charged Fluids	Residual fluids from process gas and contaminated lubrication resulting from process operations.
Non-drive end also: – N-side – NDE (non-drive end)	End of the machine to which no drive is connected.

Table 5 Technical terms and their meaning

2 Safety

The manufacturer is not liable for damages caused by a failure to observe the provisions of this documentation.

2.1 Intended use

- Only use the machine to move the stipulated fluids (→ Machine-specific construction sheet).
- Do not operate the machine above the maximum permissible speed (→ Chapter 3.1.1, Page 10).
- Do not operate the machine below the permissible charged flow rate.
- Avoid surge:
  - Do not operate the machine with the fitting on the outlet end closed.
- Avoid damage to the motor:
  - Do not switch on the motor more than the maximum permissible number of times per hour (→ manufacturer's specifications).
- Consult the manufacturer about any other use.
- Machines delivered without a motor must be assembled into a machine group according to the provisions of the Machinery Directive 2006/42/EC.

Prevention of obvious misuse (examples)

- Observe the operating limits of the machine in respect of temperature, pressure, vibration and motor speed/amps.
- Only use the setup specified in this operating manual. For example, the following are not allowed:
  - Overhead installation
  - Installation in the immediate vicinity of extreme heat or cold sources
  - Installation too close to a wall

2.2 General safety instructions

Observe the following regulations before carrying out any work.

2.2.1 Product safety

The machine has been constructed according to the latest technology and recognized technical safety rules. Nevertheless, operation of the machine can still put the life and health of the user or third parties at risk or damage the machine or other property.

- Only operate the machine if it is in perfect technical condition and only use it as intended, remaining aware of safety and risks, and adhere to the instructions in this manual.
- Keep this manual and all other applicable documents complete, legible and accessible to personnel at all times.
- Refrain from any procedures and actions that would pose a risk to personnel or third parties.
- In the event of any safety-relevant malfunctions, shut down the machine immediately and have the problem corrected by the personnel responsible.
- In addition to the entire documentation for the product, comply with statutory or other safety and accident-prevention regulations and the applicable standards and guidelines in the country where the system is operated.

2.2.2 Operator's obligations

Safety-conscious operation

- Only operate the machine if it is in perfect technical condition and only use it as intended, remaining aware of safety and risks, and adhere to the instructions in this manual.
- Ensure that the following safety aspects are observed and monitored:
  - Adherence to intended use
  - Statutory or other safety and accident-prevention regulations
  - Safety regulations governing the handling of hazardous substances
  - Applicable standards and guidelines in the country where the machine is operated
- Make personal protective equipment available.

Qualified personnel

- Make sure all personnel tasked with work on the machine have read and understood this manual and all other applicable documents, especially the safety, maintenance and repair information, before they start any work.
- Organize responsibilities, areas of competence and the supervision of personnel.
- Ensure that all work is carried out by specialist technicians only:
  - Fitting, repair and maintenance work
  - Work on the electrical system
- Make sure that trainee personnel only work on the machine under the supervision of specialist technicians.

Safety equipment

- Provide the following safety equipment and verify its functionality:
  - For hot, cold and moving parts: on-site safety guards for the machine
  - For possible electrostatic charges: provide the necessary grounding
- Do not operate the machine if the safety devices are defective:
  - Regularly check and ensure that they function.

Warranty

- Obtain the manufacturer's approval prior to carrying out any modifications, repairs, or alterations during the warranty period.
- Only use OEM parts or parts that have been approved by the manufacturer.

2.2.3 Obligations of personnel

- All directions given on the machine must be followed (and kept legible), e.g. the arrow indicating the direction of rotation and the markings for fluid connections.
- Machine, coupling guard and add-on components:
  - Do not step on them or use as climbing aids
  - Do not use them to support boards, ramps or beams
  - Do not use them as a fixing point for winches or supports
  - Do not use them for storing paper or similar materials
  - Do not use hot machine or motor components as a heating source
  - Do not de-ice using gas burners or similar tools
  - Do not inhale the air discharged at the outlet port
- Do not remove the safety guards for hot, cold or moving parts during operation.
- Use personal protective equipment whenever necessary.
- Only carry out work on the machine when it is at a standstill.
- Isolate the motor from its supply voltage and keep it locked when carrying out any fitting or maintenance work.
- Reinstall the safety equipment as required by regulations after any work on the machine.

2.3 Specific hazards

2.3.1 Explosion-hazard area

- See the ATEX supplementary operating manual (→ Chapter 1.2, Page 5).

2.3.2 Hazardous charged fluids

- Follow the safety regulations for handling hazardous substances when handling hazardous (e.g. hot, flammable, poisonous or potentially harmful) charged fluids.
- Use personal protective equipment when carrying out any work on the machine.

3 Layout and function

3.1 Name plates

3.1.1 Standard Name plate

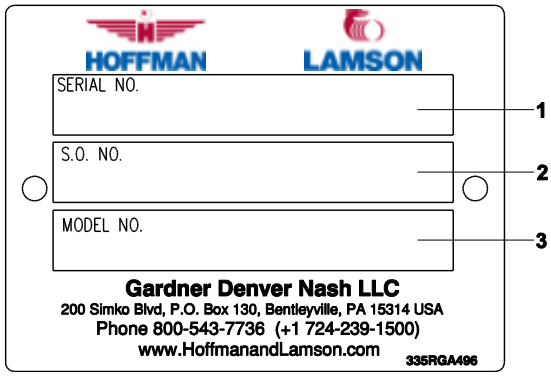


Fig. 1 Standard Name plate

1 Serial number
2 Sales order number
3 Model number

3.1.2 ATEX & CE Name plate

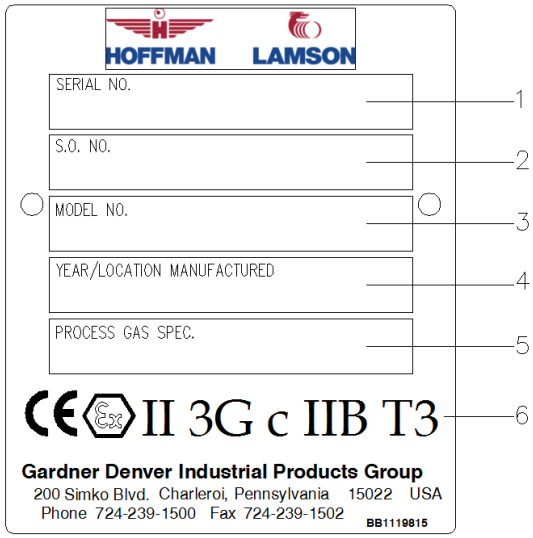


Fig. 2 ATEX & CE Name plate

1 Serial number
2 Sales order number
3 Model number
4 Manufactured location and year
5 Specific process gas data
6 Permissible ATEX classification

3.2 Layout

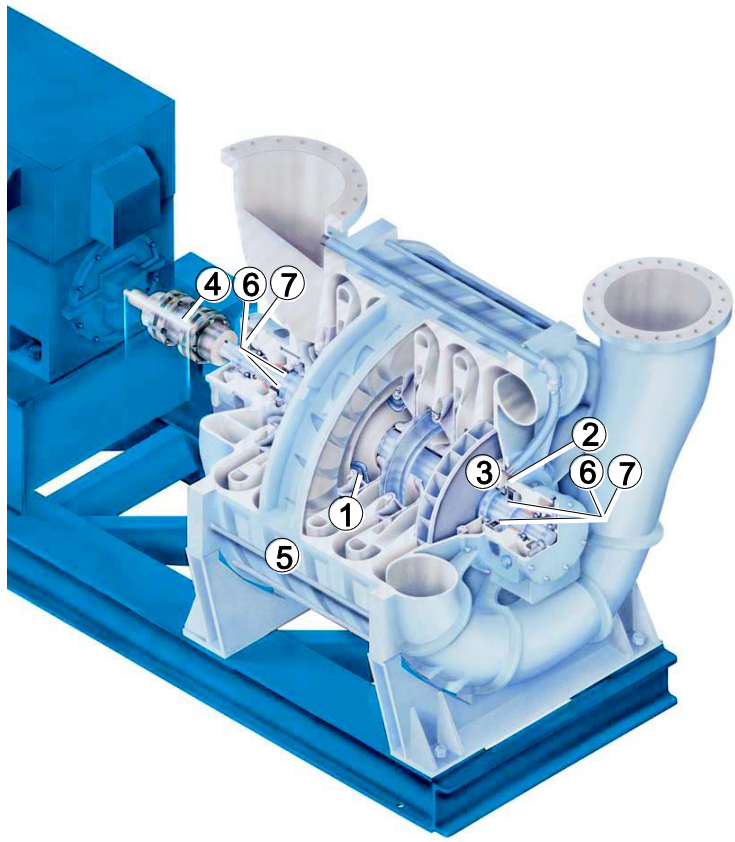


Fig. 3 Blower layout

1 Baffle Rings (select models)
2 Balance Piston
3 Impellers
4 Flexible coupling
5 Casing/Section
6 Labyrinth seal (standard)
7 Carbon ring seal/MAX seal (optional)

3.3 Shaft bearing

The fixed bearing on the inlet end is the machine's guide bearing. It bears radial and axial forces. It is designed to bear normal axial loads generated through operation with flexible couplings.

The discharge bearing only bears radial forces.

The bearings are lubricated with grease or oil.

3.4 Function

Blowers are dynamic low pressure compressors.

An impeller rotates within the casing. As the impeller rotates, air enters the eye of the impeller. The rotation of the impeller accelerates the air radially outwards. There, part of the dynamic pressure is converted into static pressure.

The overall characteristics of the blower are determined by the number of stages and the selection of the impellers. For example, higher pressure can be generated by employing several impellers in series. Air from a previous stage moves radially into the eye of the next impeller, so that the process is repeated, increasing the pressure at each stage.

The individual stages of the blower increase the compression heat causing raised temperatures at the outlet. This difference in the heat generated at the inlet and outlet ends requires a precise alignment of the blower to the motor, in particular when the operating temperature is reached. This generation of heat causes thermal growth of the blower at the outlet end and must be taken into account when aligning the coupling while it is cold (→ Chapter 5.7.3, Page 24).

3.4.1 Pressure surges

Pressure surges occur when the flow rate falls below the minimum permitted threshold for which the blower is designed. This causes an interruption of the flow that results in return flow and pulsation of the fluid.

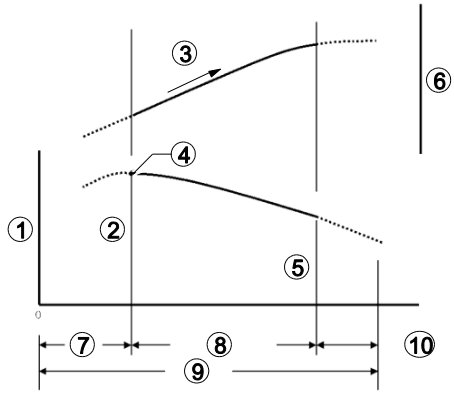


Fig. 4 Occurrence of pressure surges

1 Pressure (in bar/PSI)
2 Pressure surge limit
3 Increasing amperage as flow rate increases
4 Peak pressure
5 Maximum flow rate
6 Motor amperage
7 Pressure surges
8 Safe operating range
9 Flow rate (in m³/CFM)
10 Motor overload

The following problems can be caused by pressure surges and, in the worst case, damage the machine irreparably:

- Severe damage to the impellers
- Rotating components in the machine collide
- Bearing failure
- Damage to the shaft
- Damage to the machine due to increased operating temperature

3.5 Further equipment (if provided)

- Cooling Coils:

For optimized performance, use the lowest temperature cooling water available. If cooling is insufficient, increase the flow rate to improve the effectiveness of the cooling coil.

- Heat Shield:

In some applications, a heat shield may be installed. This design helps to block the bearing housing from weather and radiant heat from the machine surfaces.

- Cooling Fan:

⚠ CAUTION

Rotating equipment, risk of injury!

▶ Ensure the cooling fan guard is properly installed, preventing human contact with the fan.

- Purge Seals:

For optimized performance, supply a pressure of 3.5 KPa (0.5 PSIG) greater than the machine internal pressure. This will mitigate the chances for process leakage to ambient air.

4 Transport, storage, and disposal

4.1 Transport

Observe the weight specifications (→ order specific outline drawing).

4.1.1 Unpacking and inspection on delivery

Standard scope of delivery includes only the machine itself (excluding additional components such as fittings, valves, ball valves etc.)

1. Unpack the machine/package on delivery and inspect it for transport damage.
2. Report any transport damage to GD Nash immediately.
3. Dispose of packaging material according to local regulations.

4.1.2 Lifting

DANGER

Death or crushing of limbs caused by falling or overturning loads!

- ▶ Use lifting gear appropriate for the total weight to be transported.
- ▶ Fasten the lifting gear as illustrated. Make sure that no connected fittings are damaged.
- ▶ Never fasten lifting gear to the shaft.
- ▶ Never fasten lifting gear to the motor eyebolt.
- ▶ Do not stand under suspended loads.
- ▶ Set the load down on a level surface.

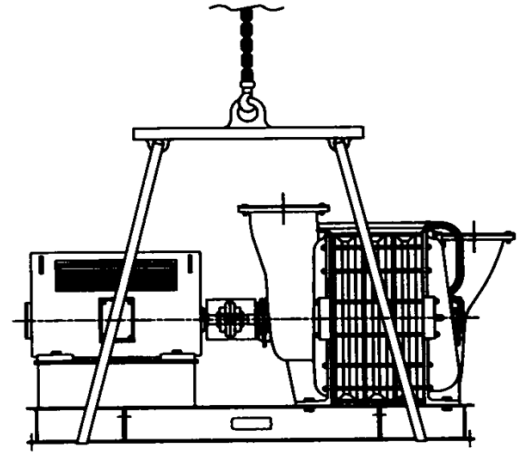


Fig. 5 Fastening the lifting gear to the steel base of the machine group

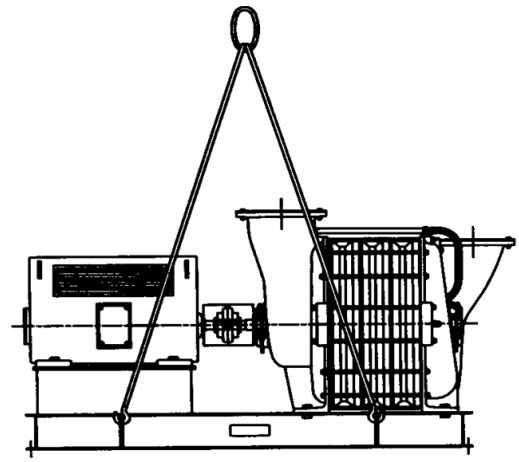


Fig. 6 Fastening the lifting gear with eye bolts to the machine group

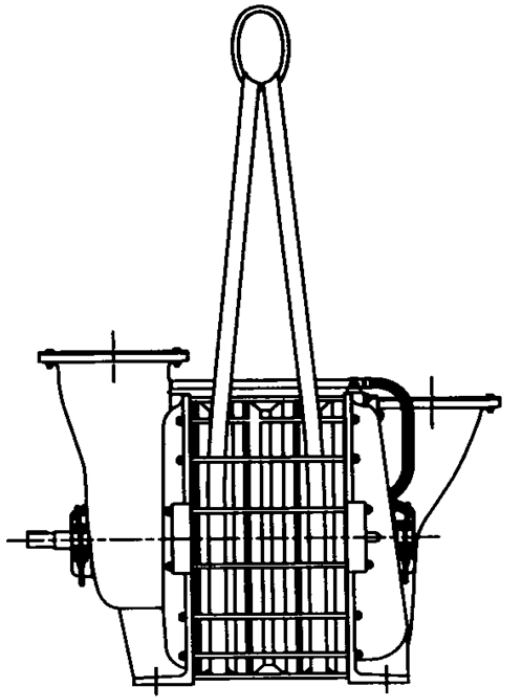


Fig. 7 Fastening the lifting gear to an individual machine

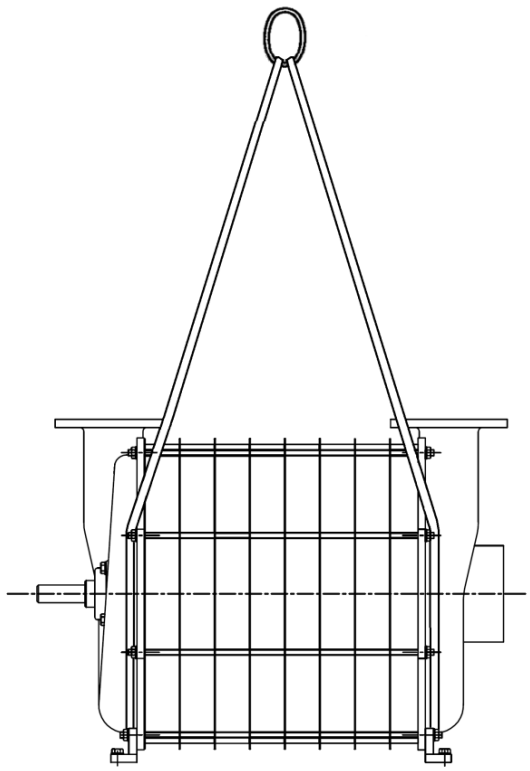


Fig. 8 Fastening the lifting gear to an individual T–Series machine

1. Lift machine/package correctly.
   - A single cast machine: Fasten the slings as near as possible to the inlet and outlet heads and run them under the tie rods.
   - A single fabricated machine: Fasten the slings as near to the inlet and outlet mounting feet as possible and run them parallel to the heads.
   - Do not place the slings around the shaft or a flange.
   - Do not place the slings over the tie rods. Always run the slings under the tie rods.
2. Lower machine/package correctly.
   - Take care to prevent impacts.

4.2 Preservation

Machines can be preserved as follows:

- Capsules filled with anti-corrosion agents
- Rust-inhibitor spray

4.3 Storage

NOTE

Risk of damage due to inappropriate storage!

▶ Treat and store the machine properly.

4.3.1 Short term storage (within 90 days)

1. Make sure the storage room meets the following conditions:
   – Dry
   – Stays above freezing
   – Vibration-free
   – Level
   – Well ventilated
2. Turn the impeller through 5 to 10 revolutions every week.

4.3.2 Long-term storage

For storage periods longer than 90 days, the following instructions apply in addition to the instructions for short-term storage (→ Chapter 4.3.1, Page 15).

Storage of the machine

1. Every 6 months, remove a flange cover to inspect internal surfaces of the machine for signs of rust:
   – If there are signs of rust, reapply corrosion protection.
2. Check the external surfaces of the machine for signs of rust:
   – If there are signs of rust, apply an anti-corrosion coating to the machine.

Storage of the motor

▶ Observe the instructions of the motor manufacturer in respect to storage (→ Chapter 1.2, Page 5).

4.4 Removing the preservative

Anti-corrosion capsules (if used) must be removed:

1. Remove the covers of the inlet and outlet flanges.
2. Remove the anti-corrosion capsules.

4.5 Disposal

WARNING

Risk of poisoning and environmental damage by the charged fluids!

▶ Use protective equipment when carrying out any work on the machine.

▶ Prior to the disposal of the machine:
   – Collect and dispose of any leaking fluids, oil, or grease escaping from the bearings in accordance with local regulations.
   – Neutralize residues of charged fluids in the machine.
   – Remove the preservative (→ Chapter 4.4, Page 15).

▶ Remove the plastic parts and dispose of them in accordance with local regulations.

▶ Dispose of the machine according to local regulations.

5 Setup and connection

For machines in explosion-hazard areas (→ Chapter 1.2, Page 5).

If you have any questions or problems in respect of the installation and commissioning, you can obtain support from Hoffman & Lamson Service.

⚠ CAUTION

Risk of injury through burns due to high surface temperatures!

During operation of the machine, surface temperatures > 50 °C (122 °F) occur at the outlet end.

- ▶ Provide the personnel with thermal protective equipment.

NOTE

Risk of damage due to distortion or passage of electrical current in the bearing!

- ▶ Do not make any structural modifications to the machine group or machine casing.
- ▶ Do not carry out any welding work on the machine group or machine casing.

NOTE

Risk of damage to bearings!

- ▶ Observe the operating instructions.
- ▶ Do not attach crane rope to bearings.
- ▶ Remove anti-corrosion coating (if present) from the shaft end with acetone. Do not use scrapers or emery cloth. Afterwards, coat shaft ends with grease.

NOTE

Risk of damage caused by dirt!

- ▶ Do not remove any caps or transport and sealing covers until immediately before connecting the pipes to the machine.

5.1 Preparing the setup

5.1.1 Checking machine condition

1. Check the machine and components for damage.
2. Check the impeller/shaft assembly for smooth rotation.
3. Check the machine interior for foreign matter. To do so, remove the transport covers and check accessible interior spaces for foreign matter.

5.1.2 Checking the ambient conditions

NOTE

Risk of overheating due to insufficient ambient air flow!

- ▶ Ensure an air turnover rate of at least 10, specifically in the area relative to the blower discharge.

- ▶ Make sure that the required ambient conditions are fulfilled.

5.1.3 Sliding foot arrangement (if present)

- ▶ Make sure that the sliding foot arrangement is not blocked.
- ▶ Make sure that all horizontal adjusting screws on the non drive end side are loose.

5.1.4 Preparing the installation site

NOTE

Risk of freezing during installation in low temperatures!

- ▶ Make sure that no water enters into the machine or any already connected pipes.

▶ Ensure the installation site meets the following conditions:

- Machine is freely accessible from all sides
- Sufficient space for the installation/removal of the pipes and for maintenance and repair work, especially for the removal and installation of the machine and the motor
- Machine is not exposed to external vibrations (damage to bearings)
- Frost protected
- Grounding in accordance with local regulations and in accordance with explosion-protection regulations if applicable (→ Chapter 1.2, Page 5).
- All valves and controls are easily accessible. Consider ladders and handrails to increase accessibility.

5.1.5 Preparing the foundation and surface

▶ Make sure that the foundation and surface meet the following conditions:

- Level
- Clean (no oil, dust or other impurities)
- Capable of bearing the weight of the package and all operating forces
- Will ensure the package is stable and cannot tip over

▶ Check the horizontal alignment of the foundation using a surveyor's level.

▶ Make sure the foundation meets the following requirements:

- Clean and level with a maximum unevenness of 0.5 % (1/16” per foot [5.3 mm/m] slope)
- Clean and level with a maximum deviation of 3.1 mm (1/8 inch) over the length and width of the foundation

5.1.6 Balancing the impellers and rotor assembly

The impellers and rotor assembly are balanced in accordance with ISO 1940/1 to G2.5 tolerance.

5.2 Installing the machine

NOTE

Risk of damage due to distortion of the base frame!

▶ The anchor bolts are only to be used as locating bolts:

- Hand tighten the hardware, then back off ½ turn.
- Lock the hardware in place with a jam nut.
- Make sure that there is space between the hardware and base.

▶ Do not set the base frame of the machine in concrete.

5.2.1 Setting the machine on the foundation

1. Lift the machine with the base frame (→ see Chapter 4.1.2, Page 13).
2. Place the supplied mounting dampers under the base frame as indicated by the decals on the base. Failure to comply may result in harmful vibrations.
3. Set the machine on the foundation.

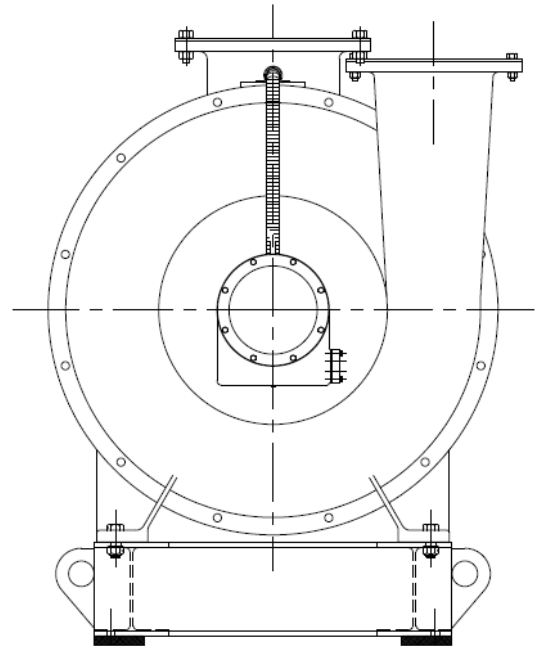


Fig. 9 Mounting dampers (black) under the machine

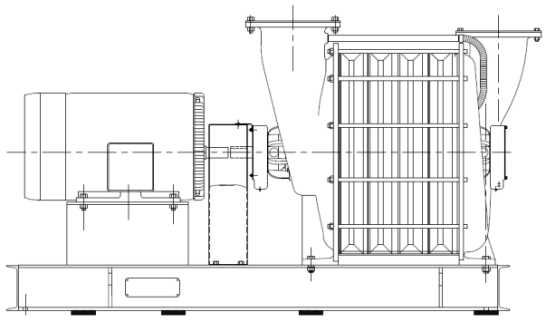


Fig. 10 Mounting dampers (black) under the machine – side view (reference only)

4. Ensure that the load is evenly distributed over the decals on the base (→ order specific outline drawing). Pad locations can be adjusted to reduce vibration.

5.2.2 Aligning the machine

NOTE

Risk of damage due to inappropriate alignment!

- ▶ Compensate for height differences exactly as described.
- ▶ Align the drive train exactly as described by THE HOT ALIGNMENT TAG.

1. Ensure that the machine stands steady. If necessary, compensate for any remaining distance between base frame and foundation by using, for example, metal shims.
   - – Place metal shims between the mounting dampers and the foundation.
2. If aligning pins are available, use only to position the machine.
   - – Ensure that there is space around the aligning pins.
   - – Ensure that the aligning pins are not in contact with the foundation.

5.3 Installing the motor

Observe the manufacturer's installation and operating instructions.

NOTE

Risk of damage due to knocks and bumps!

- ▶ Keep the coupling halves properly aligned when slipping them on.
- ▶ Do not knock or hit any components of the machine.

1. Smear a very thin coat of molybdenum disulfide (e.g. Molykote) on the shaft ends of the machine and motor.
2. Insert the shaft keys.
3. Without a mounting fixture: Remove the flexible element from coupling and heat the coupling halves up to approximately 100 °C [210 °F].
4. Slide on the machine-side and motor-side coupling halves until the shaft end is flush with the coupling hub. When doing this, ensure the prescribed spacing between the two halves of the coupling is maintained (→ Chapter 1.2, Page 5, Coupling manufacturer's instructions).
5. Screw in the motor bolts, but do not tighten them yet.

5.4 Planning the pipe lines

Piping connection diagrams (→ Chapter 9.2, Page 40).

Observe the technical specifications on charged fluids, permissible pressures (intake, discharge, and test pressure) (→ Chapter 9.2.8, Page 44).

5.4.1 Specifying supports and flange connections

NOTE

Risk of damage due to excessive forces and torques exerted by the piping on the machine!

▶

1. Calculate the pipe line forces, taking every possible operating condition into account:
   – Cold/warm
   – Depressurized/pressurized
   – Shift in position of flanges
2. Ensure the pipe supports have permanent low-friction properties and do not seize up due to corrosion.
3. Make sure that the pipe lines and all accessories are suitable for high temperatures (temperatures may exceed 149 °C [300 °F]. according to Machine-specific construction sheet).
4. Take precautions in respect of the thermal expansion of the machine and pipe lines. Use flexible connections as much as possible.

5.4.2 Specifying nominal diameters

Keep the flow resistance in the pipe lines as low as possible.

1. Make sure the nominal inlet pipe diameter is ≥ the nominal inlet port diameter.
2. Make sure the nominal outlet pipe diameter is ≥ the nominal outlet port diameter.

5.4.3 Providing accessories

Installing a throttle valve

Use a throttle valve in the inlet pipe line to ensure that the machine starts correctly and that the flow rate through the machine can be controlled.

1. Install a throttle valve in the inlet pipe line.
2. Ensure that a settling section of twice the pipe diameter is observed.
3. Observe the correct alignment and opening direction of the throttle valve.

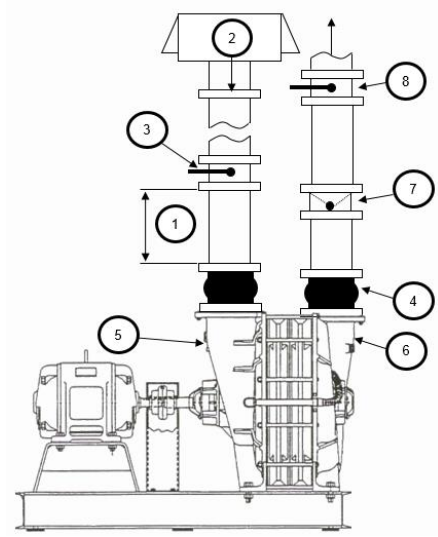


Fig. 11 Correct positioning of the throttle valve in the inlet pipe

1 Settling section (2 x inlet pipe diameter)
2 Air Flow
3 Throttle Valve
4 Expansion Joints
5 Inlet Head
6 Outlet Head
7 Discharge Check Valve
8 Discharge Isolation Valve

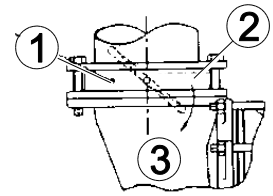


Fig. 12 Incorrect positioning of the throttle valve in the inlet pipe

1 Throttle Valve
2 Air Flow
3 Inlet End

Providing flexible connections

▶ Install flexible connections in the inlet and outlet pipe lines to ensure that the pipe lines are insulated from the machine flanges:
   – Ensure that the maximum deviation of the pipe lines is according to the tolerances of the expansion joints (data sheet).
   – For temperatures >130 °C [266° F] use a stainless compensator.

5.4.4 Providing safety and control devices (recommended)

For machines in explosion-hazard areas (→ Chapter 1.2, Page 5).

Avoiding impurities

1. Make sure that the inlet piping system is clear of foreign materials or debris prior to installing machine.
2. To monitor impurities, install a differential pressure gauge with a contact manometer if necessary (by using a filter).

Avoiding backflow

- ▶ Use a check valve in the outlet pipe to ensure that gas does not flow back into the machine.
- ▶ On machines in vacuum systems, use a check valve in the inlet pipe to ensure that gas does not flow back into the vacuum system.

For the horizontal installation of the check valve:

- ▶ Install the check valve so that the fastening bolts that run through the check valve are vertical to the flow.

Making provision for isolating and shutting off the pipe lines

For maintenance and repair work.

- ▶ Provide isolation valves for both the inlet and outlet when maintenance is anticipated.

Allow measurements of the operating conditions

1. Provide manometers for pressure measurements in the inlet and outlet pipes.
2. Provide load monitors (overload and underload) on the motor side.
3. Provide for machine-side temperature measurements.
4. Install a vibration monitor system (→ Table 11).

5.5 Connecting the pipe lines

5.5.1 Keeping the pipe lines clean

NOTE

Risk of damage due to impurities in the machine!

- ▶ Make sure that no impurities can enter the machine.

1. Clean all pipes and fittings prior to installation.
2. Ensure that no flange gaskets protrude into the flow.
3. Remove any blank flanges, plugs, protective foils, and/or protective paint from the flanges.

5.5.2 Installing the inlet pipe

1. Remove the transport and sealing covers from the machine along with any rust preventative packets (if present).
2. Install the inlet pipe.
3. Make sure that the gaskets not to protrude into the flow.

5.5.3 Installing the outlet pipe

1. Remove the transport and sealing covers from the machine.
2. Install the outlet pipe.
3. Make sure that the gaskets do not to protrude into the flow.

5.5.4 Installing the condensate discharge pipe (if present)

WARNING

Risk of injury and poisoning due to hazardous charged fluids!

- ▶ Safely collect any leaking fluids, then discharge and dispose of it in accordance with environmental regulations.

1. Install the condensate discharge pipes.
2. Connect the condensate discharge pipes to each other.

5.5.5 Shaft seals

All shaft seals will emit fugitive gases.
Contact GD Nash for replacement parts. Be prepared to provide the model size and sales order number.

- Standard Shaft Seal:

Standard shaft seal has a labyrinth design. This is a non-contacting, minimal wear seal.

- Single Carbon Ring Seals (SCR):

Single Carbon Ring Seals (SCR) are available for most machines. The SCR is superior to the labyrinth seal design. The SCR contacts the shaft. Replacement intervals depend on the process gas.

- Double Carbon Ring Seals (DCR):

Double Carbon Ring Seals (DCR) are available for most machines. They are superior to the SCR + seals. DCR seals provide purge connections. For toxic applications, purge gas should be implemented to minimize leakage to atmosphere.

- MAX Seals:

MAX Seals are superior to DCR seals. They provide the highest level of protection for the bearings.

5.5.6 Checking the stress-free pipe connection

✓ Piping installed and cooled down

NOTE

Risk of machine damage due to excess pipe forces!

▶ Ensure that all pipes are stress-free when connected to the machine.

1. Disconnect the pipe connecting flanges from the machine.
2. Check whether the pipes can be moved freely in all directions within the expected range of expansion:
   – Nominal diameter < 150 mm (5.9 inch): by hand
   – Nominal diameter > 150 mm (5.9 inch): with a small lever
3. Make sure the flange surfaces are plane-parallel.
4. Reconnect the pipe connecting flanges to the machine.

5.5.7 Checking the pipes for leaks

▶ Perform a leak test for the entire system with the pipes connected, e.g. a soap bubble test at 0.5 bar (7 psi) overpressure.

5.6 Electrical connection

DANGER

Risk of electrocution!

▶ Have all electrical work carried out by qualified electricians only.

DANGER

Risk of fatal injury due to rotating parts!

▶ Disconnect the motor from its power supply and keep it locked when carrying out any installation or maintenance work.

5.6.1 Electrical connection

1. Connect all the electric components according to the circuit diagram/manuals/data sheets. GD Nash recommends to use the following monitoring equipment:
   – Vibration sensors
   – Platinum RTD sensors
   – Current transformer
2. Correctly connect the current transformer (→ Manufacturer's instructions).

Fig. 13 Installing the current transformer

1 2 turns
2 1 turn

5.6.2 Variable Frequency Drive (VFD)

If the machine is intended to be operated with VFD, approval is required by GD Nash engineering.

All blower models are designed to operate below the first critical speed. However, when coupled with a motor, coupling and coupling element, the combination of the machines may result in a natural resonance lower than the standard operating frequency.

5.6.3 Connecting the motor

Observe the instructions of the motor manufacturer.

1. Connect the motor according to the connection diagram.
2. Make sure no danger arises due to electric power.
3. Install an EMERGENCY STOP switch.

5.7 Aligning motor and machine

All units are shipped from the factory with a preliminary alignment only. The Customer is required to complete preliminary HOT alignment at job site. Centrifugal blowers must stabilize at operating temperature: this can take up to 1 hour. Proper shimming and alignment procedures must be followed as listed below. Lack of vibration at start up does not necessarily indicate perfect alignment. Gardner Denver recommends checking all driver (motor) support feet for "soft foot". This aids in obtaining a more exacting alignment

✓ Foundation is level

✓ Machine is set up correctly

✓ Pipe lines are attached to the machine with flexible connections

✓ Motor is standing steady on all its feet (a deviation of < 0.076 mm (0.003 inch) is permissible)

5.7.1 Aligning the coupling

The coupling can be aligned by Hoffman & Lamson Service.
The best method of alignment is with a laser alignment device.
Hoffman & Lamson offers factory trained technicians and laser alignment services.

Checking the alignment of the coupling

✓ Resources, tools and materials:

- Dial indicator
  or
- laser alignment device

▶ With a laser alignment device (recommended): See the instructions supplied with the laser device.

▶ With a dial indicator:

- Place the dial indicator on the coupling halves.
- Rotate both shafts simultaneously and take readings every 90°.
- Check the readings for vertical or angular misalignment and correct if necessary.

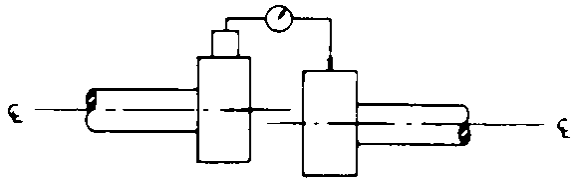
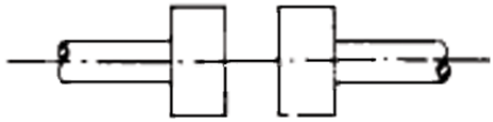


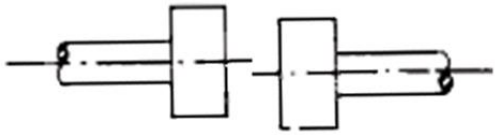
Fig. 14 Aligning the coupling with a dial indicator

The following scenarios may arise during coupling alignment:

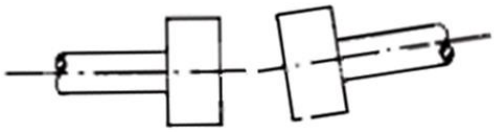
Correctly aligned:



Vertical misalignment:



Angular misalignment:



Aligning the coupling

All alignment changes are in respect to the alignment of the motor.

1. Make sure that the coupling halves have a maximum deviation of 0.05 mm (0.002 inch).
2. Correct vertical and angular misalignment with metal shims under the motor.
3. Ensure that there is enough air between coupling halves (→ Coupling manufacturer's instructions).

5.7.2 Aligning the motor

Aligning a sleeve bearing motor

1. Ensure that a suitable coupling is used (→ Coupling manufacturer's instructions). The coupling should prevent the axial movement of the motor.
2. Make sure that the magnetic axis is aligned correctly.

Aligning the belt drive

✓ Resources, tools and materials:

– Straightedge

1. Position the belt drive as close as possible to the machine.
2. Place a straightedge across the face of the driving and driven sheaves.
3. Check the alignment of the sheaves and correct if necessary.

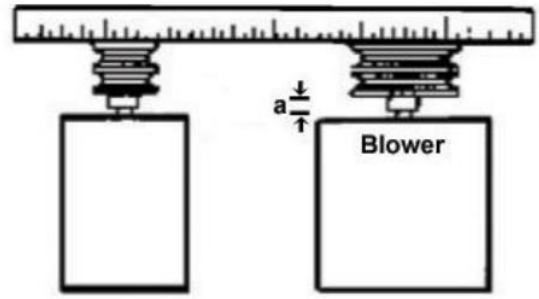


Fig. 15 Correctly aligned belt drive
Distance "a" must be minimized

DANGER

Risk of serious injury due to pinch point created by belt and sheave!

▶ Disconnect the motor from its power supply and keep it locked when carrying out any installation or maintenance work.

4. Check the belt tension and correct if necessary (→ Chapter 7.2.4, page 33).

5.7.3 Preparing the alignment of the coupling at operating temperature

Prior to the alignment at operating temperature, the necessary adjustments can be calculated. The following assumptions are made:

- The only thermal expansion at operating temperature occurs at the outlet end of the machine. The inlet end can be assumed to be constant.
- Thermal expansion of the motor is negligible.

In calculating the adjustments, the following variables are used:

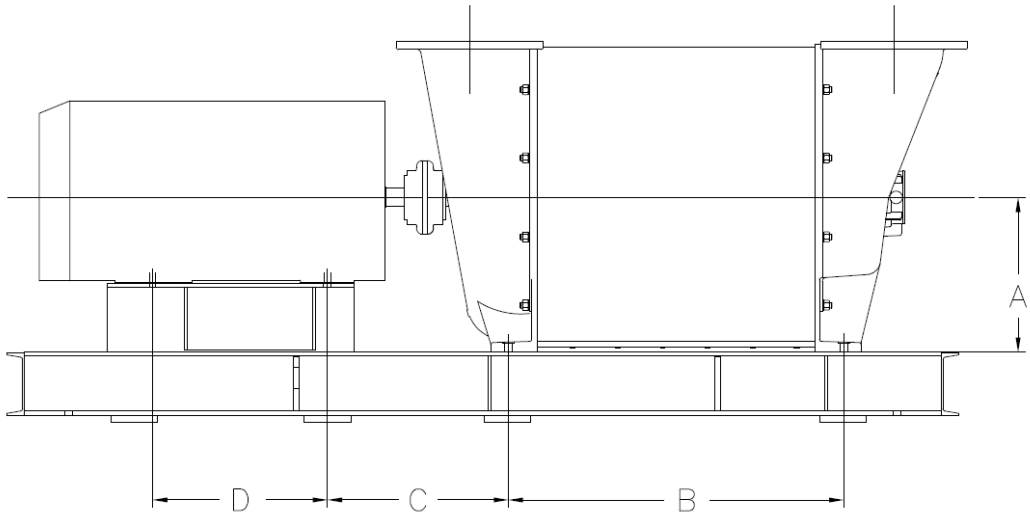


Fig. 16 Variables used in calculating the adjustment

Variable	Meaning
A	Height of shaft Distance from the center line of the shaft to the bottom of the blower feet (models 2400, 940,950, and 960: distance from shaft to bottom of support surface on head).
B	Distance between the machine feet, from the center lines of the fixing bolts
C	Distance from the drive end machine foot to the drive end motor foot
D	Distance between the motor feet
COE	Coefficient of linear expansion COE (gray cast iron) = 10.5 x 10^{-6} 1/K [6.0 x 10^{-6} 1/°R]
T (Δt)	Change in the temperature from the casing at the inlet end to the casing at the outlet end If the exact values are not known, 15 K [59 °R] can be assumed for each machine stage
E	Thermal growth of the outlet head Calculated on the basis of: E = A x T (Δt) x COE

Table 6 Variables used in calculating the adjustment

In the calculation, a distinction must be made between two types of setup:

- Motor coupled to the inlet end of the machine
- Motor coupled to the outlet end of the machine

Motor coupled to the inlet end of the machine

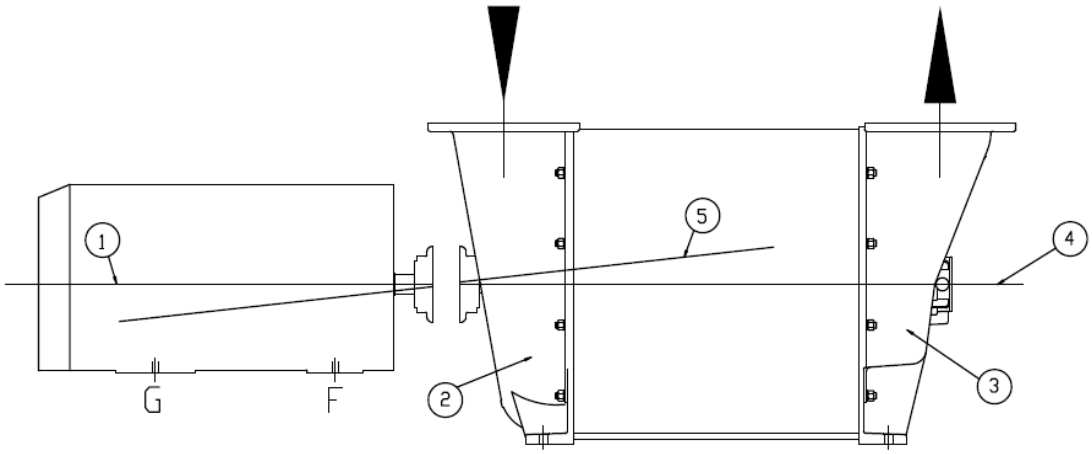


Fig. 17 Calculation of the adjustment with the motor on the inlet end

1 Motor shaft
2 Inlet end temperature
3 Outlet end temperature
4 Position of the cold machine shaft
5 Position of the hot machine shaft

As the motor is lower than the machine, the calculated adjustment will be a negative number.

1. Calculating the adjustment for the motor feet:
   – For motor feet on the drive end **F**:
     F = (C / B) x E
   – For motor feet on the non-drive end **G**:
     G = [(C + D) / B] x E
2. Align the cold motor with metal shims. Subtract the calculated values for F and G.

Motor coupled to the outlet end of the machine

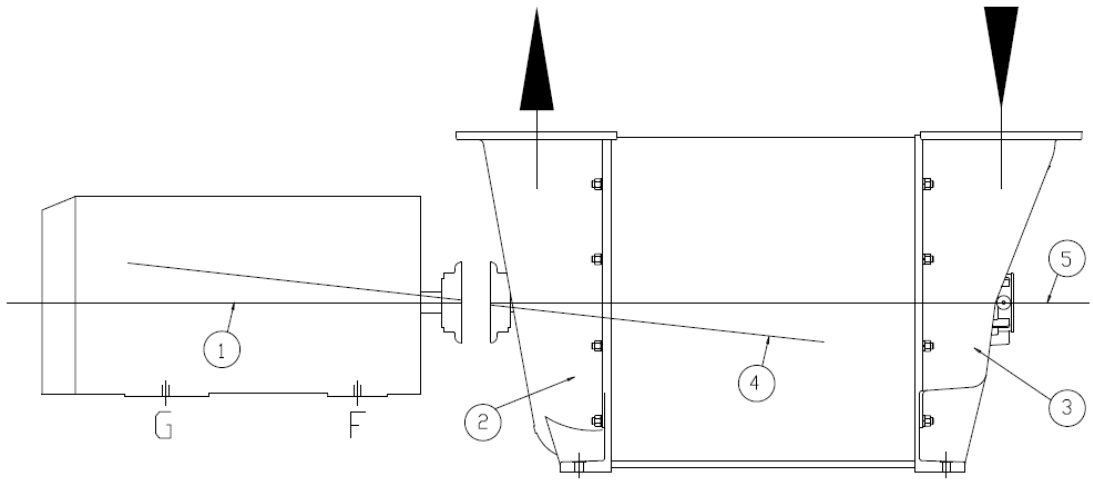


Fig. 18 Calculation of the adjustment with the motor on the outlet end

1 Motor shaft
2 Outlet end temperature
3 Inlet end temperature
4 Position of the hot machine shaft
5 Position of the cold machine shaft

As the motor is higher than the machine, the calculated adjustment will be a positive number.

1. Calculating the adjustment for the motor feet:
   – For motor feet on the drive end **F**:
   F = [(C + B) / B] x E
   – For motor feet on the non-drive end **G**:
   G = [(B + C + D) / B] x E
2. Align the cold motor with metal shims. Add the calculated values for F and G.

5.8 Installing safety guards

1. Secure moving parts with safety guards to prevent serious injury. Ensure guards cover all rotating components, eliminating the ability to be accessed by hand during operation.
2. Do not fasten any temperature-sensitive components or lines to hot machine parts.

5.9 Checking the installation

Further checks may be necessary as per supplementary instructions or system-specific conditions.

▶ Ensure that:
   – The drive motor is correctly adjusted and installed in such a way as to prevent axial movement.
   – The belt drive (if present) is correctly aligned and adjusted.
   – The machine is correctly installed.
   – The impeller/shaft assembly can be rotated without making contact.
   – The coupling is correctly aligned.
   – Rotating parts are correctly guarded.
   – Pipe systems and fittings have been installed in the correct positions, are not distorted and have been pressure-tested.

6 Operation

6.1 Preparing for the initial start-up

This section applies in respect of the commissioning or recommissioning after longer periods of disuse or repairs.

✓ All ball valves and valves have been closed.

6.1.1 Removing the preservative

Only necessary for machines treated for storage.

▶ (→ Chapter 4.4, Page 15).

6.1.2 Lubricating the bearings

Machines with grease-lubricated antifriction bearings are ready for operation upon delivery. The greatest cause of bearing failure is over-greasing rather than under-greasing. Excessive grease creates overheating which may result in bearing damage. Always follow the proper greasing procedure.

▶ Grease-lubricated bearings: if storage > 3 months before the initial start-up, check the bearing for water condensation and lubricate again if necessary.

▶ T-Series bearing housings are pre-packed at the factory. Do not re-grease before starting the unit.

▶ Oil-lubricated bearings: fill oil up to the middle of the sight glass.

6.1.3 Preparing the coupling

1. For gear type couplings: sufficiently lubricate the gears with grease (→ Coupling manufacturer's instructions).
2. For couplings with lubricating bushings: inject grease into the lubricating bushings until these are full (→ Coupling manufacturer's instructions).

6.1.4 Checking the direction of rotation

▶ Check direction of rotation by bumping the motor. The correct direction of rotation is indicated by an arrow on the inlet head.

6.1.5 Preheating the machine

If the machine is used for applications in which the inlet temperatures > 93 °C (200 °F) (such as for steam recompression):

▶ slowly preheat the machine to 82 °C (180 °F).

6.2 Initial start-up

We recommend having the machine commissioned by Hoffman & Lamson Service.

6.2.1 Switching on

✓ Machine set up and connected properly

✓ Motor set up and connected properly

✓ Motor exactly aligned with the machine

✓ All connections stress-free and sealed

✓ All safety equipment installed and tested for functionality

✓ Entire system is ready for operation

✓ Machine prepared properly

DANGER

Risk of injury due to running machine!

▶ Do not touch the machine while it is running.

▶ Ensure that the coupling guard is attached.

▶ Do not carry out any work on the machine while it is running.

▶ Allow the machine to cool down completely before starting any work.

NOTE

Risk of damage if the maximum discharge pressure is exceeded!

▶ Do not operate the machine with the outlet fitting closed.

NOTE

Risk of damage due to pressure surges in the machine!

▶ Ensure that the flow rate through the machine does not fall below the minimum.

NOTE

Risk of damage by introducing hot gases or vapors without preheating!

▶ Slowly preheat the machine to 82 °C (180 °F) for steam or hot temperature process gas conditions.

6.2.2 Precisely aligning the coupling

Due to the difference in thermal expansion of the inlet and outlet ends, the machine must be precisely aligned to the motor.

The thermal expansion data of the machine may be available on the hot alignment data plate (→ Chapter 3.1.1, Page 10).

1. Operate the machine for 1.5 to 2 hours (→ Chapter 6.3, Page 28).
2. Ensure that the vibrations do not exceed 10 mm/s (0.38 ips) during initial start up.
3. Switch off the machine.
4. Check the alignment of the coupling according to the alignment specifications (→ Coupling instructions, Chapter 5.7, Page 22).
5. If there is a deviation from the alignment specifications: correctly align the motor with metal shims.

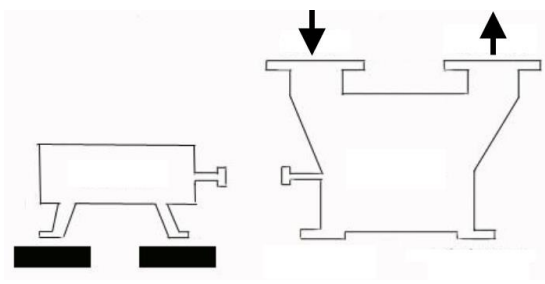


Fig. 19 Hot alignment data plate located next to the blower nameplate (Metal shims installed beneath motor feet only)

6.3 Start-up

6.3.1 Switching on

✓ Initial start-up completed

✓ Machine prepared properly

DANGER

Risk of injury due to running machine!

▶ Do not touch the machine while it is running.

▶ Ensure that the coupling guard is attached.

▶ Do not carry out any work on the running machine.

▶ Allow the machine to cool down completely before starting any work.

NOTE

Risk of damage if the maximum discharge pressure is exceeded!

▶ Do not operate the machine with the outlet or inlet fitting closed.

NOTE

Risk of damage due to pressure surges in the machine!

▶ Ensure that the flow rate through the machine does not fall below the minimum.

NOTE

Risk of damage by introducing hot gases or vapors without preheating!

▶ Slowly preheat the machine to 82 °C (180 °F) for steam or hot temperature process gas conditions.

NOTE

Risk of damage by shafts and impellers still rotating!

▶ After switching off of the machine or an EMERGENCY STOP, wait until the shafts and impellers come to a standstill.

Start up the machine without pressure.

Start up procedure for soft start and direct start

1. Open the section drain valves (if present).
2. Open the bypass valves (if present).
3. Open the throttle valve in the outlet pipe line.
4. Close the throttle valve in the inlet pipe line.
5. Switch on the drive motor.
   By using a soft start: Make sure that the drive motor reaches full speed within approx. 7 to 10 seconds.
6. After reaching full speed: Slowly open the throttle valve in the inlet pipe within 10 to15 seconds.

If the throttle valve cannot be opened in this time:

▶ Start the machine with the throttle valve minimally (10% to 15%) opened

7. Close the section drain valves (if present).
8. When operating temperature is reached: Regulate the flow rate with the throttle valve in the inlet pipe until the desired operating pressure is reached.
9. Adjust the bypass valves (if present).
10. If there are pressure surges in the machine, open the bypass valve.

Start up procedure for VFD start

1. Open the diffuser valves (if present).
2. Open the bypass valves (if present).
3. Open the throttle valve in the outlet pipe line.
4. Close the throttle valve in the inlet pipe line.
5. Switch on the drive motor.
   By using a VFD: Make sure that the drive motor reaches full speed within approx. 10 seconds.
   To do so:
   – Set the Ramp up time to 7 to 10 seconds.
   – Set the minimum speed ~10% above the surge point.

↳ On VFD operation: The inlet throttle valve opens to 100% and remains 100% open.

If the throttle valve cannot be opened in this time:

▶ Start the machine with the throttle valve minimally (10% to 15%) opened

6. Close the section drain valves (if present).
7. Adjust the bypass valves (if present).
8. Adjust the speed to keep the blower in operation range (above surge, below overload) while closing the bypass valve.
9. Once the section valves and bypass valves are closed: Adjust the speed to the desired operation conditions (i.e. pressure and flow).
10. If there are pressure surges in the machine, open the bypass valve.

6.3.2 Checking operation

Proper operation must be checked immediately after the initial commissioning and subsequently at regular intervals.

1. Read and document the set pressure values and flow rates.
2. If unusual vibrations and bearing temperatures arise, check the alignment of motor and machine and adjust if necessary (→ Chapter 5.7, Page 22).
3. For belt drives: Regularly check the belt tension (→ Chapter 7.2.4, Page 33).
4. Monitor and document the temperatures of the components (bearings, shaft seal) until steady-state is reached.
5. Monitor the vibrations of the motor and the temperature of the bearings. Normal vibrations amount to 10 mm/s (< 0.38 ips) vertically and horizontally.
6. If irregularities are observed, identify and eliminate causes (→ Chapter 8, Page 37).

6.3.3 Switching off

WARNING

Risk of injury due to hot machine parts!

▶ Use personal protective equipment when carrying out any work on the machine.

1. Switch off the drive motor.
2. Open the bypass valves (if present).

6.4 Shutting down

✓ Machine switched off and depressurized

WARNING

Risk of injury and poisoning due to hazardous fluids!

▶ Safely collect any leaking fluids and dispose of them in accordance with environmental rules and requirements.

▶ Take the following measures whenever operation is interrupted:

Machine is to be	Measure
Drained	▶ Close the inlet and outlet fittings.
Disassembled	▶ Isolate the motor from its power supply and secure it against unauthorized switch-on.
Put into storage	▶ Follow the storage instructions (→ Chapter 4.3, Page 15).

Table 7 Measures to be taken if the machine is shut down

6.5 Start-up following a shutdown period

1. If the machine has been shut down for > 1 year, lubricate the bearings before recommissioning the machine.
2. Carry out all steps as for the initial commissioning (→ Chapter 5.9, Page 26; Chapter 6.3, Page 28).

7 Maintenance

For machines in explosion-hazard areas (→ Chapter 1.2, Page 5).

Trained service technicians are available for fitting and repair work. Present a pumped medium certificate when requesting service (→ Chapter 9.3, Page 46).

Anytime work is carried out on the machine, ensure there is sufficient lighting to avoid serious injury.

7.1 Testing the control systems

7.1.1 Surge control (if present)

1. Start the machine.
2. Set the trip point in surge control slightly above the point at which pressure surges occur in the machine (→ Surge control instructions).
3. With the machine operating normally, slowly close the throttle valve on the inlet end. Observe the amperage on the surge control.

↳ As soon as the amperage reaches the set trip point, the surge control must switch off the motor.

If motor is not switched off:

▶ Check the installation of the current transformer (→ see Chapter 5.6, Page 21).

7.1.2 Ammeter

▶ Check the readings of the ammeter:

- Start the machine.
- Attach an external ammeter to the machine when operating normally and read the actual amperage draw of the motor.
- Compare the reading with the reading displayed by the installed ammeter. The deviation must be < 5 %.

7.1.3 Overload protection

If the motor has overload protection, a high AMPS trip point is also set for the gage.

1. Start the machine.
2. With the machine operating normally, decrease the trip point until it is less than the actual reading.

↳ The overload alarm is triggered and/or the motor is switched off.

3. Ensure that all sirens, warning lights, etc. respond to the overload condition.

7.1.4 Monitoring the temperature of the bearings

An alarm is preset in the factory at a temperature of 104 °C (220 °F) as well as a trip point at 110 °C (230 °F). These values are sufficient for all applications and do not need to be adjusted.

7.1.5 Vibration sensors

1. Ensure that the following values are set (direct drive units):
   - Alarm: 10 mm/s (0.4 ips)
   - Trip point: 19 mm/s (0.75 ips)
2. Test the functionality of the vibration sensors according to the specifications of the manufacturer.

7.2 Monitoring

The recommended intervals assume malfunction-free operation.
In the event of malfunctions, the corresponding inspections or reinspections should be performed immediately.

The inspection intervals depend on the operational conditions of the machine.

DANGER

Risk of injury due to running machine!

▶ Do not touch the machine while it is running.

▶ Do not carry out any work on the running machine.

WARNING

Risk of injury and poisoning due to hazardous charged fluids!

▶ Use personal protective equipment when carrying out any work on the machine.

▶ For trouble-free operation, always ensure the following:

- No leaks
- Unclogged and clean filters
- No unusual running noises or vibrations
- Check the alignment of motor and machine due to seasonal variations in operating conditions every six months

7.2.1 Inspection

Perform a first general inspection approx. 150 operating hours after initial commissioning of the machine.
Perform a first inspection of the belt drive after approx. 2 operating hours.

Perform the following during the inspection:

1. Make sure that the charged fluid does not display any signs of significant contamination.
2. Make sure that the specified technical data is observed (power consumption, temperatures etc.).
3. Ensure that there is no leakage.
4. Ensure that there are no pressure surges.
   - Filters are clean and free of foreign particles
   - Valves and fittings are functioning and set correctly
   - Pipe lines are laid out correctly
5. Check that the smooth running of the machine and the running noises of the bearings have not deteriorated.
6. Check the alignment of machine and motor and adjust if necessary.
7. Check the foundation for sink marks and cracks.
8. Check the mounting dampers and replace if necessary (recommended: every 3 years).
9. Make sure that the valves, filters, and screens are free of foreign matter. Clean if necessary.
10. Check pipes, fittings, and containers for strength, leaks, and secure fit.
11. Check connecting elements and re-tighten if necessary.
12. Check the safety system.
13. For belt drives: Check belt pre-tensioning and correct if necessary.
14. Immediately eliminate any identified impermissible deviations and modifications.
15. Schedule appointment for reinspection based on soiling and wear.

7.2.2 Reinspection

Under favorable operating conditions, reinspections are subject to the same intervals applicable for lubrication or grease changes (→ Chapter 7.2.5, Page 33).

1. Perform the inspection (→ Chapter 7.2.1, Page 32).
2. Check that the impeller's alignment lies within the permissible tolerance range.
3. Make sure that all fastening bolts have been properly tightened.

7.2.3 Packing Gland for Gas Tight Construction

NOTE

Risk of damage due to over-tightening of packing gland!

▶ Make sure not to over-tighten the packing gland to cause excessive friction, which would lead to a temperature spike in the bearing.

1. Check the hardware of the packing gland to ensure a nylon locknut design**.**
2. The hardware is to contact the packing housing.
3. Tighten the packing gland an additional ¼ turn.
4. Observe the operation of the packing gland to ensure that the adjustmet does not result in excessive temperature.

GD Nash suggests the use of a temperature monitoring device to observe the temperature during operation once the gland has been adjusted.

7.2.4 Belt drive

NOTE

Risk of damage due to overtensioned belt drive!

An overtensioned belt drive causes excessive wear and the premature failure of the belt drive.

▶ Check the tension of the belt drive at regular intervals.

1. Check the belt drive regularly.
2. When replacing a belt drive in combination with other belt drives, replace all the belts.
3. Check the belt tension (→ Requirements of the manufacturer):
   – Divide the distance “L” of the sheaves by 64 into inches.
   The result is the deflection “d” of the belt.
   – Make sure that the belt has a tension of 22.5–31.5 N (5–7 lbs) at the calculated deflection.

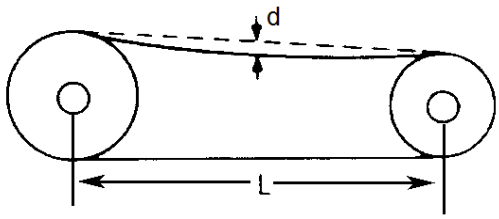


Fig. 20 Checking the belt tension

4. Correctly adjust the belt tension:
   – Adjust the belt tension 9 N (2 lbs) higher for new belts to allow for stretching.
   – Recheck the belt tension after 8 operating hours.

7.2.5 Antifriction bearings lubricated with grease

Grease to be used (→ Chapter 9.2.5, Page 42).

The temperature of the bearings can increase considerably after relubrication, however, after a running-in phase it must sink down to the normal value <93 °C (200 °F).

Bearing greasing procedure:

1. Remove the bearing covers and bearing plugs.
2. Remove the old grease from the bearings, bearing housing and covers.
3. Remove the plug at the rear of the bearing housing.
4. Inject fresh grease into this opening. Thereby, forcing the old grease from bearing.
5. Remove the excess grease.
6. Insert a small amount of lubricating grease into the bearing plug.
7. Replace the bearing covers and bearing plugs.

7.2.6 Bearings with oil lubrication

Oils to be used (→ Chapter 9.2.6, Page 43).

1. Stop the machine and let come to rest.
2. Read the oil level from the sight glass. There are sight glasses are on both sides of the oil reservoir.
   The correct oil level is in the middle of the inspection glass.
3. Refill with oil, if necessary:
   – Remove the filler and breather filter on the reservoir.
   – Slowly refill with oil until the proper level is reached.
   – Replace the filler and breather filter.

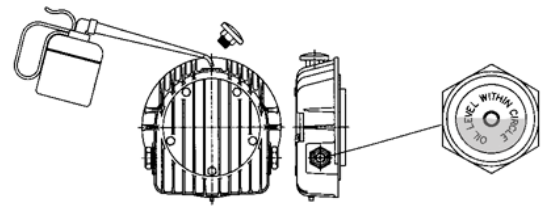


Fig. 21 Filling the oil reservoir

4. Clean the oiler, oil reservoir and sight glass.

7.2.7 Cleaning the external surfaces of the machine

CAUTION

Risk of injury when cleaning with compressed air!

- Make sure that a suitable extraction system is employed.
- Use personal protective equipment.

NOTE

Risk of damage due to unsuitable cleaning agents.

- Make sure that the cleaning agents are compatible with the machine.

Schedule cleaning at intervals in accordance with the level of soiling determined during the first inspection.

- Clean or replace the screens and filters in the pipes.
  When doing so, make sure that no debris falls into the machine from the screens of filters.

Some installations may require a wash-down cycle for the machine interior. Not all machines are provided with the wash-down port. The Typical cleaning solvent is steam.

1. Open the condensation drain piping and close the isolation valves at the inlet and outlet.
2. Steam the interior of the machine.
3. Continue steam cleaning until the condensate discharge appears to be clean.

7.3 Disassembly

GD Nash can accept no liability if the machine is disassembled incorrectly.

DANGER

Risk of injury due to running machine!

- Do not touch the machine while it is running.
- Do not carry out any work on the running machine.
- Disconnect the motor from its power supply and keep it locked when carrying out any installation or maintenance work.

DANGER

Risk of electrocution!

- Have all electrical work carried out by qualified electricians only.

WARNING

Risk of injury and poisoning due to hazardous charged fluids!

- Use personal protective equipment when carrying out any work on the machine.
- Allow the machine to cool down completely before commencing any work.
- Make sure that the machine is depressurized.
- Drain the machine, safely collect the charged fluid and dispose of it in accordance with environmental regulations.

WARNING

Risk of injury due to heavy components!

- Be aware of the weight of components. Lift and transport heavy components using suitable lifting gear.
- Set down components safely and secure them against overturning and rolling away.

WARNING

Risk of injury during disassembly!

- ▶ Wear protective gloves as components can become very sharp due to wear or damage.
- ▶ Remove spring-loaded components carefully (e.g. mechanical seals, tensioned bearings, valves etc.), as components can be ejected by the spring tension.
- ▶ Observe the manufacturer's specifications (e.g. for the motor, coupling, shaft seal, drive shaft, drives, belt drive).

7.3.1 Returning the blower to the manufacturer

- ✓ Machine depressurized
- ✓ Machine fully drained
- ✓ Electrical connections disconnected and motor secured against being switched on again
- ✓ Machine cold
- ✓ Coupling guard removed
- ✓ Pressure gauge lines, pressure gauge, and brackets disassembled
- ▶ Enclose an accurate and fully completed safety certificate when returning machines or components to GD Nash (→ Chapter 9.3, Page 46).

7.3.2 Preparing for disassembly

- ✓ Machine depressurized
- ✓ Machine fully drained, flushed, and decontaminated
- ✓ Electrical connections disconnected and motor secured against being switched on again
- ✓ Machine cold
- ✓ Coupling guard removed
- ✓ Auxiliary systems shut down, depressurized, and drained
- ✓ Pressure gauge lines, pressure gauge, and brackets disassembled
- ▶ Observe the following during removal:
  - – Mark the precise orientation and position of all components before disassembling them.
  - – Disassemble components concentrically without canting.

7.4 Installing

Reinstall the components concentrically, without canting, in accordance with the marks applied.
GD Nash can accept no liability if the machine is installed incorrectly.

WARNING

Risk of injury due to heavy components!

- ▶ Be aware of the weight of components. Lift and transport heavy components using suitable lifting gear.

WARNING

Risk of injury during installation!

Components may be ejected through spring tension.

- ▶ Take care when installing components with springs (e.g. pre-tensioned bearings, valves).
- ▶ Observe the manufacturer's specifications (e.g. for the motor, coupling, drive shaft, drives, belt drive).

NOTE

Risk of damage due to unsuitable components!

- ▶ Always replace lost or damaged bolts with bolts of the same strength (→ see Chapter 9.2.2, Page 41).
- ▶ Only replace seals with seals of the same material.

1. Observe the following during installation:
   - – Replace worn parts with genuine spare parts.
   - – Replace seals. Take care that the seal is seated correctly.
   - – Maintain the prescribed tightening torques (→ see Chapter 9.2.2, Page 41).
2. Clean all parts. Do not remove any markings when doing so.
3. Install the machine.
4. Replace antifriction bearings and grease them (→ Chapter 7.2.5, Page 33).
5. Install the machine in the system (→ Chapter 5, Page 16).

7.5 Ordering spare parts

GD Nash can accept no liability if parts other than genuine parts are used.

Repairs are performed by Hoffman & Lamson Service.

- Have the following information ready at hand when ordering spare parts:
  - Spare part order number as per spare parts list (→ Chapter 1.2, Page 5).
- If no spare parts list is available, have the following information from the type plate ready at hand:
  - Machine type (→ Chapter 3.1.1, Page 10)
  - Machine's serial number (→ Chapter 3.1.1, Page 10)
  - Machine's year of construction (→ Chapter 3.1.1, Page 10)

8 Troubleshooting

If malfunctions occur which are not specified in the following table or cannot be traced back to the specified causes, please consult GD Nash.

Possible malfunctions are identified by a number in the following table. This number identifies the respective cause and remedy in the troubleshooting list.

Malfunction	Number
Low flow rate or low pressure	1
Abnormal vibrations	2
Oil leakage	3
Machine overheating	4
Bearings overheating	5
Motor overheating	6
Repeated failure of bearings	7
Pressure surges	8

Table 8 Fault number assignment

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
X			X					Incorrect direction of rotation	▶ Check the arrow indicating the direction of rotation on the machine. ▶ If necessary, reverse the direction of rotation.
X			X				X	Blocked inlet pipe line	▶ Open the throttle valve completely. ▶ Clean the filter. ▶ Remove the shipping covers.
X			X				X	Partially blocked outlet pipe line	▶ Open all valves in the outlet pipe line. ▶ Check that the valves are properly installed.
X								Instrumentation display error	▶ Check that the instrumentation works and replace if necessary.
X	X				X			Faulty motor wiring	▶ Check the motor wiring and correct it if necessary. – Voltage – Phases
X			X					Increased inlet temperature	▶ Adjust the temperature to the set value.
X			X					Increased inlet pressure	▶ Adjust the pressure to the set value.
X			X					Incorrect layout or installation of the pipe lines	▶ Adjust the pipe lines as specified.
X	X		X					Foreign particles in the machine	▶ Stop the machine and remove the foreign particles.

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
	X							Incorrect installation of the base frame on the foundation	▶ Ensure that the base frame is not bolted to or cast into the foundation.
	X							Mounting dampers	▶ Ensure that they have been correctly installed. ▶ Check their condition. ▶ Ensure that their position and size is correct.
	X							Pipe line system	▶ Use flexible connections between the pipe line system and machine. ▶ Never bolt pipe lines directly to the machine. ▶ Support the pipe lines.
	X					X		Faulty coupling alignment	▶ Check the alignment of the coupling.
	X	X						Foundation	▶ Ensure that the foundation is level and that it can support the weight of the machine.
	X							Loose bolts	▶ Check the tightness of the connecting bolts of the machine and the motor to the base frame.
	X		X					Pressure surges	▶ Check the outlet and inlet pipe lines for blockages.
	X							Excessive motor vibration	▶ Switch off the motor. ▶ Check the motor bearings and replace if necessary. ▶ Check the flow rate. ▶ Check the motor for defective parts.
	X			X	X			Damaged bearings	▶ Check bearings and replace if necessary.
	X							Coupling	▶ Lubricate the coupling if necessary. ▶ Check the alignment of the coupling. ▶ Check the tightness of the bolts.
		X		X		X		Oil level too high	▶ Remove oil from the bearings.
		X		X		X		Wrong type of oil used	▶ Only use the types of oil recommended in this operating manual (→ Chapter 9.2.6, Page 43).
		X						Breather vent clogged	▶ Clean the breather vent.
		X						Gaskets leak	▶ Replace the gaskets.
		X		X		X		Bearings installed incorrectly	▶ Check the position of the oil slinger. ▶ Check the housing gasket. ▶ Check whether the oil return hole is clogged. ▶ Check whether the labyrinth is working
		X						Damaged sight glass	▶ Replace the sight glass.

Fault number								Cause	Remedy
1	2	3	4	5	6	7	8		
				X		X		Wrong type of lubricating grease used	▶ Only use the types of lubricating grease recommended in this operating manual (→ Chapter 9.2.5, Page 42).
				X		X		Excessive lubricating grease used	▶ Remove grease from the bearings.
				X		X		Worn bearing housing	▶ Replace the bearings.
					X			Inadequate air flow for motor cooling	▶ Ensure that the cooling openings are not blocked.
					X			Motor overloaded	▶ Check that the motor is large enough for the system.
					X			Belt tension	▶ Check the belt tension and correct if necessary.
						X		Machine in storage and/or used infrequently	▶ Turn the rotor every week 5–10 times.

Table 9 Troubleshooting list

9 Appendix

9.1 Drawings

9.1.1 Available flange variants

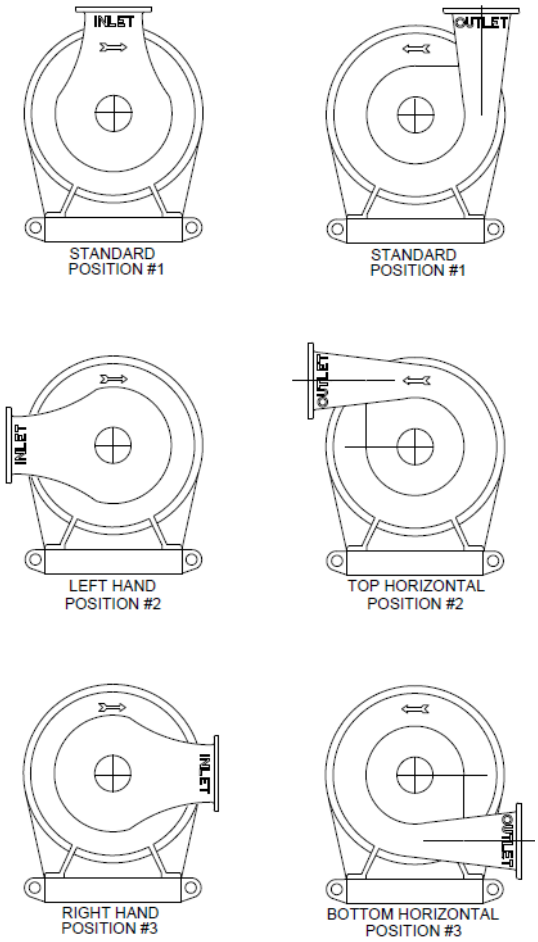


Fig. 22 Available flange variants

9.2 Technical specifications

9.2.1 Operating conditions

Information from the ATEX Supplementary Manual supersedes all limits provided in this manual.

Measurement	Value
Bearing temperature	• Inform Hoffman & Lamson Service in respect of temperatures > 104 °C (220 °F)
Outlet air temperature	• Inform Hoffman & Lamson Service in respect of temperatures > 149 °C (300 °F) • Higher outlet air temperatures are permissible if they are in accordance with the design data sheet

Table 10 Operating temperature limits

Measurement	Value
Direct Driven	• 6 mm/s (0.236 ips)
Belt Driven	• 14,5 mm/s (0.57 ips)

Table 11 Normal operating vibration limits

9.2.2 Tightening torques

All values are for dry threads. Torque tie rods to 75 % of the listed value, then repeat the torque sequence at 100 %.

Machine

Type	Tie rods			Housing Bolts		Bearing Caps Bolts		Labyrinth Bolts		Baffle Ring & Oil Slinger Screws	
	FT.LB	Size	Nm	FT.LB	Nm	FT.LB	Nm	FT.LB	Nm	FT.LB	NM
250, 260	7-8	5/16"	9-10	16-18	22-24	10-11	14-15	N/A	N/A	N/A	N/A
40, 310	30-35	1/2"	41-47	16-18	22-24	10-11	14-15	10-11	14-15	N/A	N/A
41, 400	30-35	1/2"	41-47	16-18	22-24	10-11	14-15	10-11	14-15	N/A	N/A
383, 510, 550, 732	30-35	1/2"	41-47	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
42, 600, 650	80-85	3/4"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	N/A	N/A
651, 652 ,671	80-85	3/4"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
725, 741, 742, 751, 752, 761, 772	80-85	3/4"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
810, 850, 860, 870	80-85	3/4"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
1210, 1250, 1260	80-85	3/4"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
1400	80-85	3/4"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
1850	80-85	3/4"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
1270	80-85	7/8"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
1600, 940	80-85	7/8"	108-115	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
2000, 950	90-100	7/8"	122-136	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max
691, 791, 2400, 960	90-100	1"	122-136	37-39	50-53	10-11	14-15	10-11	14-15	4 Min/ 5 Max	5 Min/ 7 Max

Table 12 Torque requirements

Pipe threads

Fitting Size	Torque [FT.LB]	Torque [Nm]
1/8" NPT	12	16
1/4" NPT	25	34
3/8" NPT	40	54
1/2" NPT	50	68
3/4" NPT	75	102
1" NPT	110	149
1 1/4" NPT	150	203
1 1/2" NPT	200	271
2" NPT	240	325

Table 13 Pipe threads

Fasteners

Blower/Motor Hold Down Fasteners		
Size	**FT.LB**	**Nm**
1/2"	46	62
5/8"	93	126
3/4"	164	222
7/8"	281	381
1"	389	527
1 1/8"	500	678
1 1/4"	625	847

Table 14 Blower/Motor Hold Down Fasteners

9.2.3 NPT Tightening Torques

All values are for threads coated with pipe sealant.

Fitting Size	Turns Past Finger Tight	Torque FT/LBS
1/8" NPT	1.5-2	12
1/4" NPT	1.5-2	25
3/8" NPT	1.5-2	40
1/2" NPT	1.5-2	50
3/4" NPT	1.5-2	75
1" NPT	1-1.5	110
1 1/4" NPT	1-1.5	150
1 1/2" NPT	1-1.5	200
2" NPT	1-1.5	240

Table 15 NPT Tightening Torques

9.2.4 Weight specifications

Information on weight and inertia: → Technical data sheet

9.2.5 Grease types

Only use the following type of grease:
- Gardner Denver AEON Centrifugal Lubricating Grease

Size	Value
NLGI grade	No. 2
Thickening agent	Lithium complex
Penetration, Worked, 25°C, ASTM D217	280
Dropping point, ASTM D2265	275 °C (527 °C)
4-Ball Weld, ASTM D 2596, Load	250 kg (550 lb)
Oil viscosity, ASTM D445	100 cSt @ 40 °C
Temperature range	-50 °C–+177 °C (-58 °F–+350 °F)

Table 16 Lubricants to be used for antifriction bearings

Type	Complete replacement		Periodic filling	
	[g]	[oz.]	[g]	[oz.]
310, 400	45	1.6	28	1.0
510, 550, 42	87	3.1	56	2.0
850, 732, 741, 742	154	5.5	84	3.0
870, 1260, 1270	196	7.0	112	4.0

Table 17 Minimum quantities for greasing antifriction bearings

Relubrication intervals: Grease

Operating conditions	Relubrication interval
Standard • Up to 24 hours/day • Clean environment • Light or normal load	Every 6 months or 3000 hours
Severe • 24 hours/day • Dusty or dirty environment	Every 3 months or 1500 hours
Extreme • 24 hours/day • Dusty or dirty environment • Very high dust levels or vibrations	Every month or every 750 hours

Table 18 Grease relubrication intervals

Relubrication intervals: Oil

Operating conditions	Relubrication interval
Standard • Up to 24 hours/day • Clean environment • Light or normal load	Every 6 months or 4000 hours
Severe • 24 hours/day • Dusty or dirty environment	Every 3 months or 2000 hours
Extreme • 24 hours/day • Dusty or dirty environment • Very high dust levels or vibrations	Every month or every 1000 hours

Table 20 Oil relubrication intervals

9.2.6 Lubricating oils

Only use the following types of oil:
AEON CF-46 is suitable for all standard applications.
AEON CF-150 is recommended for applications with outlet temperatures > 121 °C (250 °F).

Size	Gardner Denver AEON CF-46	Gardner Denver AEON CF-150
Specific gravity, ASTM D 4052, 15ºC/59 ºF	0.85	0.86
Pour point	-48 ºC (-54 ºF)	-45 ºC (-49 ºF)
Viscosity index, ASTM D 2270	135	144
Viscosity	48 cSt @ 40 ºC (104 °F)	143 cSt @ 40 ºC (104 °F)

Table 19 Suitable lubricating oils

9.2.7 Sound levels

Depending on the numbers of impeller stages different sound pressure level can be achieved.

Model	Max Sound Level [dB (A)]
550	73-91
870	81-87
1260	82-99
2000	86-92
2400	82-88
310	74-80
40	80-88
41	75-84
42	79-88
732	78-98
741	76-92
751	79-95
761	82-98
671	83-99
791	85-103

Table 21 Sound levels

9.2.8 Flange loads according to ISO 5199

Type	Flange 1 (inlet)						Flange 2 (outlet)					
	F_1 [N]	F_2 [N]	F_3 [N]	M_1 [Nm]	M_2 [Nm]	M_3 [Nm]	F_1 [N]	F_2 [N]	F_3 [N]	M_1 [Nm]	M_2 [Nm]	M_3 [Nm]
310	133	400	267	136	68	68	133	400	267	136	68	68
400	178	534	356	271	136	136	178	534	356	271	136	136
510	178	534	356	271	136	136	178	534	356	271	136	136
725	267	667	534	407	203	203	222	556	445	339	169	169
550	222	667	445	407	203	203	222	534	356	271	136	136
42	267	667	534	407	203	203	267	667	534	407	203	203
732	267	667	534	407	203	203	267	667	534	407	203	203
850	267	801	534	542	271	271	267	801	534	542	271	271
741	356	890	712	542	271	271	356	890	712	542	271	271
870	356	1068	712	678	339	339	356	801	534	542	271	271
742	445	1112	890	678	339	339	356	890	712	542	271	271
751	534	1334	1068	813	407	407	534	1334	1068	813	407	407
1260	445	1334	890	949	475	475	445	1334	890	949	475	475
752	623	1557	1246	949	475	475	445	1112	890	678	339	339
1270	667	2002	1334	1220	610	610	445	1334	890	949	475	475
761	623	1557	1246	949	475	475	623	1557	1246	949	475	475
1400	890	2669	1779	1627	813	813	890	2002	1334	1220	610	610
1600	801	2002	1601	1424	712	712	801	2002	1334	1220	610	610
1870	890	2936	1957	1898	949	949	890	2669	1779	1627	813	813
2000	890	2936	1957	1898	949	949	890	2669	1779	1627	813	813
2400	1068	3203	2135	2034	1017	1017	1068	2936	1957	1898	949	949

Table 22 Maximum permissible flange forces and torques (ISO units)

Type	Flange 1 (inlet)						Flange 2 (outlet)					
	F_1 [lbs]	F_2 [lbs]	F_3 [lbs]	M_1 [ft-lbs]	M_2 [ft-lbs]	M_3 [ft-lbs]	F_1 [lbs]	F_2 [lbs]	F_3 [lbs]	M_1 [ft-lbs]	M_2 [ft-lbs]	M_3 [ft-lbs]
310	30	90	60	100	50	50	30	90	60	100	50	50
400	40	120	80	200	100	100	40	120	80	200	100	100
510	40	120	80	200	100	100	40	120	80	200	100	100
725	60	150	120	300	150	150	50	125	100	250	125	125
550	50	150	100	300	150	150	50	120	80	200	100	100
42	60	150	120	300	150	150	60	150	120	300	150	150
732	60	150	120	300	150	150	60	150	120	300	150	150
850	60	180	120	400	200	200	60	180	120	400	200	200
741	80	200	160	400	200	200	80	200	160	400	200	200
870	80	240	160	500	250	250	80	180	120	400	200	200
742	100	250	200	500	250	250	80	200	160	400	200	200
751	120	300	240	600	300	300	120	300	240	600	300	300
1260	100	300	200	700	350	350	100	300	200	700	350	350
752	140	350	280	700	350	350	100	250	200	500	250	250
1270	150	450	300	900	450	450	100	300	200	700	350	350
761	140	350	280	700	350	350	140	350	280	700	350	350
1400	200	600	400	1200	600	600	200	450	300	900	450	450
1600	180	450	360	1050	525	525	180	450	300	900	450	450
1870	200	660	440	1400	700	700	200	600	400	1200	600	600
2000	200	660	440	1400	700	700	200	600	400	1200	600	600
2400	240	720	480	1500	750	750	240	660	440	1400	700	700

Table 23 Maximum permissible flange forces and torques (US units)

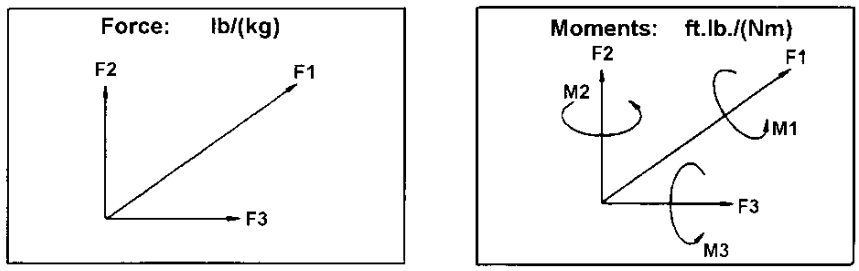


Fig. 23 Overview of forces and torques to which the flanges are subjected

9.3 Safety certificate

Fill in, sign, and submit this certificate when returning the assembly/machine for repairs and/or maintenance.

Repair and/or maintenance of the returned assembly/machine will be performed only if this certificate has been filled in completely and submitted. A separate certificate needs to be submitted for each assembly/machine.
The certificate should be attached to the exterior packaging. An additional copy of the certificate needs to be submitted in advance, e.g. by fax, to the factory executing the order.

This certificate may be filled out by qualified personnel with the operator's express authorization.

Operator's details:

Company/department/institute: _____

Street: _____

City, zip code: _____

Contact person: _____

Position: _____

Phone no.: _____

Fax no.: _____

Details of the assembly/machine:

Product designation: _____

Type: _____

Factory no. (No.N): _____

Reason for return: _____

_____

_____

The signatory hereby certifies that the above assembly/machine*)

☐ Has not been in contact with hazardous substances.

☐ Has not been used in any materials and/or components, such as seals, containing asbestos.

☐ Was used for the following application _____

_____

and came into contact with the following substances subject to mandatory identification or harmful to health:

Trade name:	Chemical name:	Substance properties (e.g. toxic, flammable, corrosive, radioactive):

*) Check as appropriate

Table 24 Safety certificate

Service Centers

Australia	Wetherill Park, Sydney, NSW
Brazil	Campinas-SP
China	Boshan, Beijing, Shanghai, Chengdu, Guangzhou
Germany	Nuremberg
The Netherlands	Assendelft
Singapore	Singapore
South Africa	Wadeville
South Korea	Seoul
United Kingdom	Winsford, Cheshire
USA	Birmingham, AL Cleveland, OH Houston, TX St. Peters, MO Vancouver, WA

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Installation, Operation and Maintenance Manual of Electric Motors

INSTALLATION, OPERATION AND MAINTENANCE MANUAL OF ELECTRIC MOTORS

This manual provides information about WEG induction motors fitted with squirrel cage, permanent magnet or hybrid rotors, low, medium and high voltage, in frame sizes IEC 56 to 630 and NEMA 42 to 9606/10.
The motor lines indicated below have additional information that can be checked in their respective manuals:

- Smoke Extraction Motors;
- Electromagnetic Brake Motors;
- Hazardous Area Motors.

These motors meet the following standards, if applicable:

- NBR 17094-1: Máquinas Elétricas Girantes - Motores de Indução - Parte 1: trifásicos.
- NBR 17094-2: Máquinas Elétricas Girantes - Motores de Indução - Parte 2: monofásicos.
- IEC 60034-1: Rotating Electrical Machines - Part 1: Rating and Performance.
- NEMA MG 1: Motors and Generators.
- CSA C 22.2 N°100: Motors and Generators.
- UL 1004-1: Rotating Electrical Machines - General Requirements.

If you have any questions regarding this manual please contact your local WEG branch, contact details can be found at www.weg.net.

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1. TERMINOLOGY

Balancing: the procedure by which the mass distribution of a rotor is checked and, if necessary, adjusted to ensure that the residual unbalance or the vibration of the journals and/or forces on the bearings at a frequency corresponding to service speed are within specified limits in International Standards.
[ISO 1925:2001, definition 4.1]

Balance quality grade: indicates the peak velocity amplitude of vibration, given in mm/s, of a rotor running free-in-space and it is the product of a specific unbalance and the angular velocity of the rotor at maximum operating speed.

Grounded Part: metallic part connected to the grounding system.

Live Part: conductor or conductive part intended to be energized in normal operation, including a neutral conductor.

Authorized personnel: employee who has formal approval of the company.

Qualified personnel: employee who meets the following conditions simultaneously:
- Receives training under the guidance and responsibility of a qualified and authorized professional;
- Works under the responsibility of a qualified and approved professional.

Note*: The qualification is only valid for the company that trained the employee in the conditions set out by the authorized and qualified professional responsible for training.*

2. INITIAL RECOMMENDATIONS

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. Therefore, it is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.
Also the applicable procedures and relevant standards of the country where the machine will be installed must be considered.
Noncompliance with the recommended procedures in this manual and other references on the WEG website may cause severe personal injuries and/or substantial property damage and may void the product warranty.

For practical reasons, it is not possible to include in this Manual detailed information that covers all construction variables nor covering all possible assembly, operation or maintenance alternatives.
This Manual contains only the required information that allows qualified and trained personnel to carry out their services. The product images are shown for illustrative purpose only.

For *Smoke Extraction Motors*, please refer to the additional instruction manual 50026367 available on the website www.weg.net.

For brake motors, please refer to the information contained in WEG 50006742 / 50021973 brake motor manual available on the website www.weg.net.

For information about permissible radial and axial shaft loads, please check the product technical catalogue.

The user is responsible for the correct definition of the installation environment and application characteristics.

During the warranty period, all repair, overhaul and reclamation services must be carried out by WEG authorized Service Centers to maintain validity of the warranty.

2.1. WARNING SYMBOL

Warning about safety and warranty.

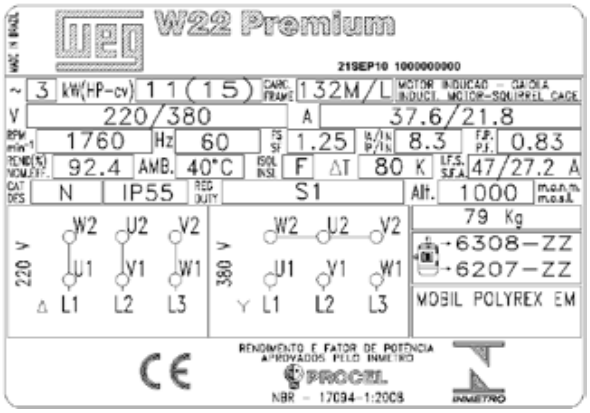
2.2. RECEIVING INSPECTION

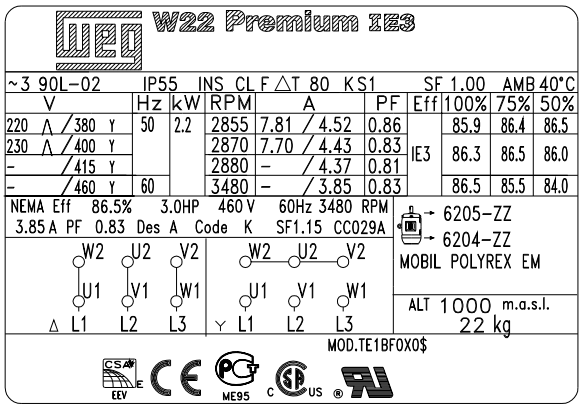
All motors are tested during the manufacturing process.
The motor must be checked when received for any damage that may have occurred during the transportation. All damages must be reported in writing to the transportation company, to the insurance company and to WEG. Failure to comply with such procedures will void the product warranty.
You must inspect the product:
- Check if nameplate data complies with the purchase order;
- Remove the shaft locking device (if any) and rotate the shaft by hand to ensure that it rotates freely;
- Check that the motor has not been exposed to excessive dust and moisture during the transportation.

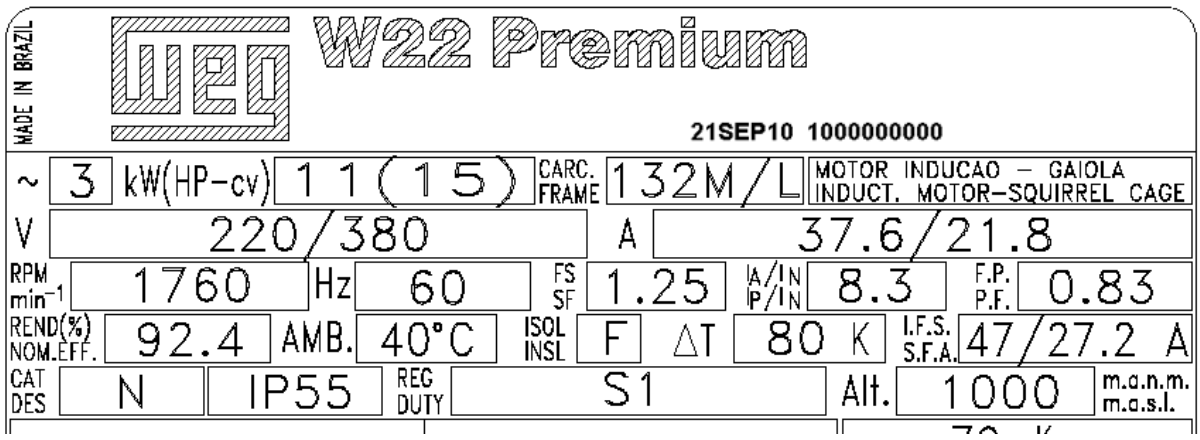
Do not remove the protective grease from the shaft, or the plugs from the cable entries. These protections must remain in place until the installation has been completed.

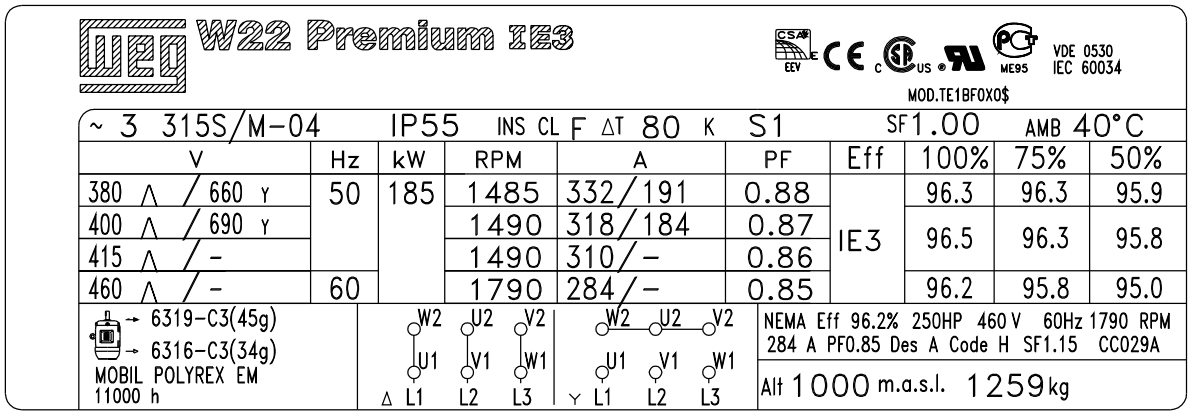
2.3. NAMEPLATES

The nameplate contains information that describes the construction characteristics and the performance of the motor. Figure 2.1 and Figure 2.2 show nameplate layout examples.









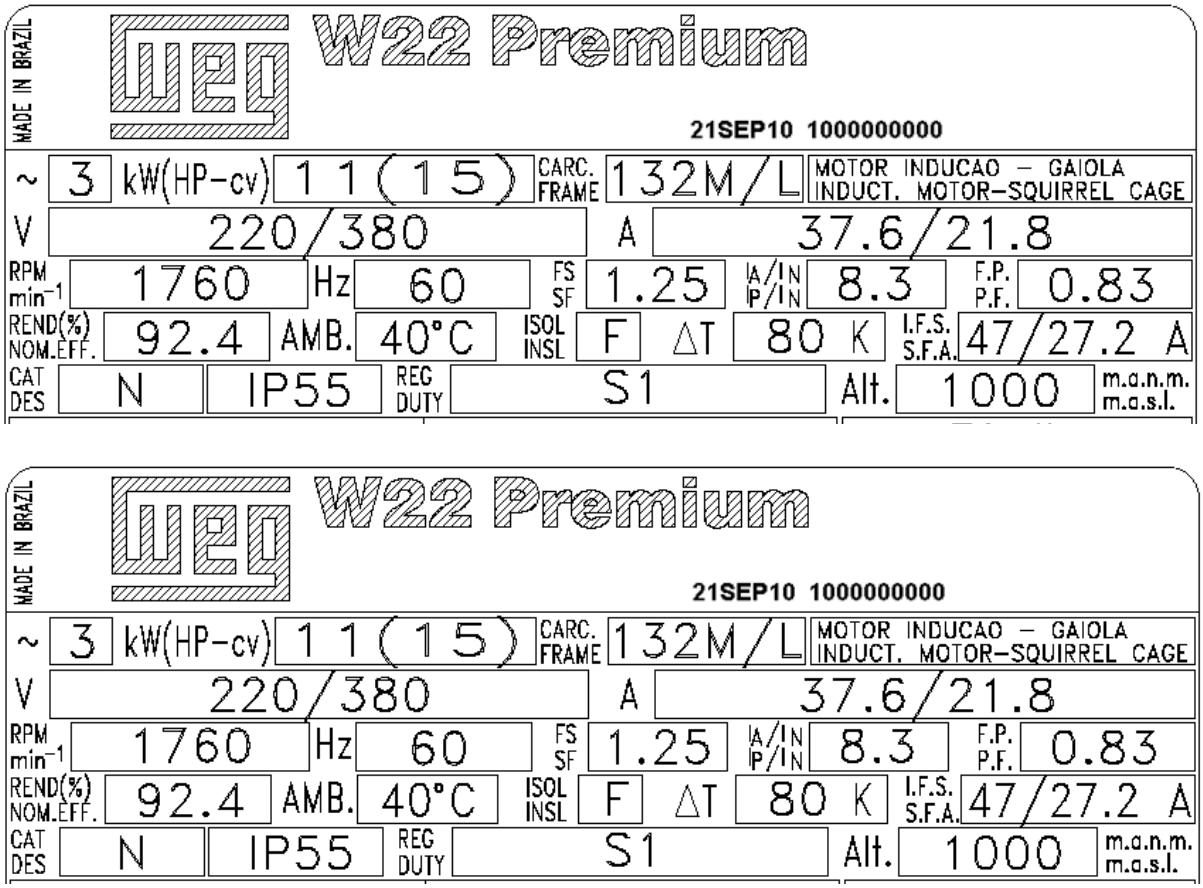
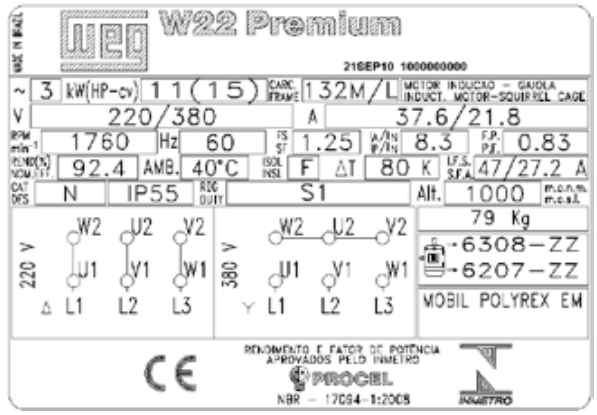


Figure 2.1 *- IEC motor nameplate*



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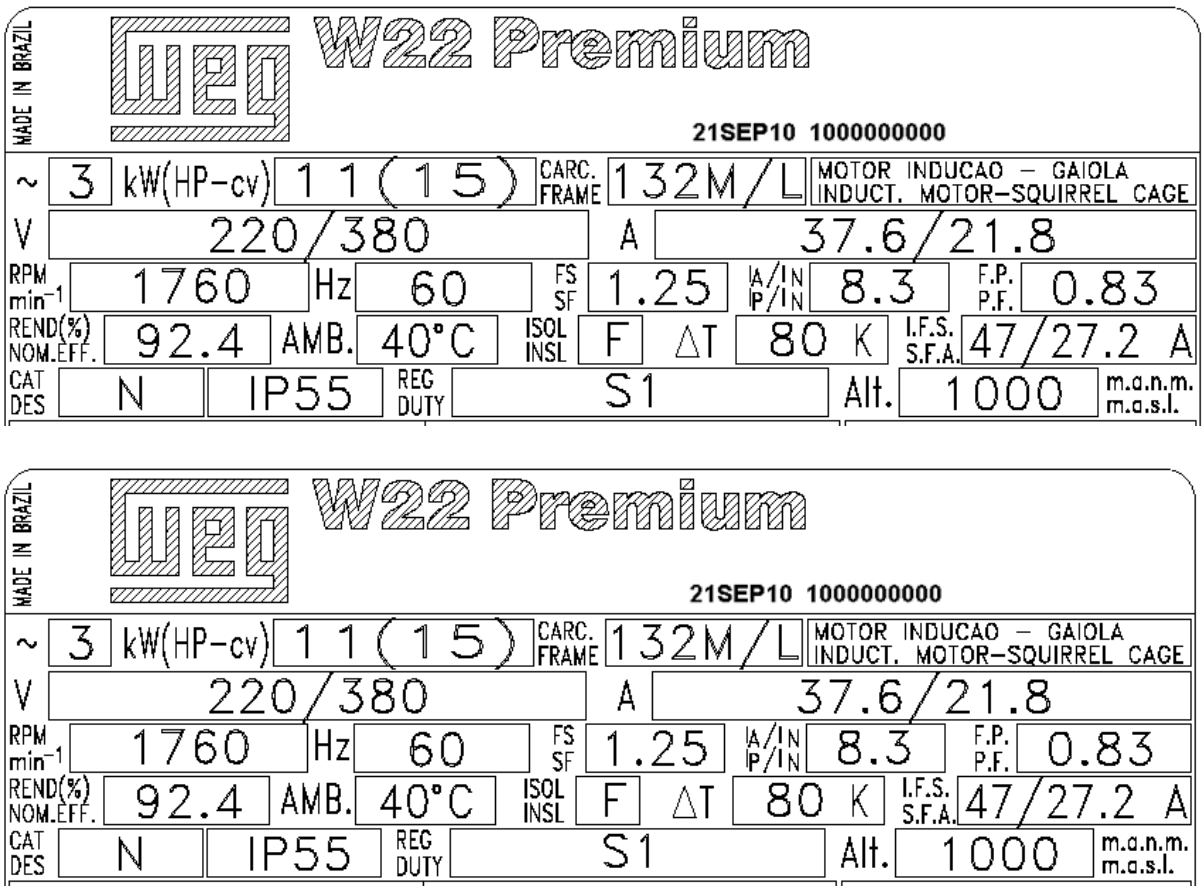

Figure 2.2 *- NEMA motor nameplate*

3. SAFETY INSTRUCTIONS

The motor must be disconnected from the power supply and be completely stopped before conducting any installation or maintenance procedures. Additional measures should be taken to avoid accidental motor starting.

Professionals working with electrical installations, either in the assembly, operation or maintenance, should use proper tools and be instructed on the application of standards and safety requirements, including the use of Personal Protective Equipment (PPE) that must be carefully observed in order to reduce risk of personal injury during these services.

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. It is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.

Always follow the safety, installation, maintenance and inspection instructions in accordance with the applicable standards in each country.

4. HANDLING AND TRANSPORT

Individually packaged motors should never be lifted by the shaft or by the packaging. They must be lifted only by means of the eyebolts, when supplied. Use always suitable lifting devices to lift the motor. Eyebolts on the frame are designed for lifting the machine weight only as indicated on the motor nameplate. Motors supplied on pallets must be lifted by the pallet base with lifting devices fully supporting the motor weight.

The package should never be dropped. Handle it carefully to avoid bearing damage.

Eyebolts provided on the frame are designed for lifting the machine only. Do not use these eyebolts for lifting the motor with coupled equipment such as bases, pulleys, pumps, reducers, etc..

Never use damaged, bent or cracked eyebolts. Always check the eyebolt condition before lifting the motor.

Eyebolts mounted on components, such as on end shields, forced ventilation kits, etc. must be used for lifting these components only. Do not use them for lifting the complete machine set.

Handle the motor carefully without sudden impacts to avoid bearing damage and prevent excessive mechanical stresses on the eyebolts resulting in its rupture.

To move or transport motors with cylindrical roller bearings or angular contact ball bearings, use always the shaft locking device provided with the motor.
All HGF motors, regardless of bearing type, must be transported with shaft locking device fitted.

4.1. LIFTING

Before lifting the motor ensure that all eyebolts are tightened properly and the eyebolt shoulders are in contact with the base to be lifted, as shown in Figure 4.1. Figure 4.2 shows an incorrect tightening of the eyebolt.
Ensure that lifting machine has the required lifting capacity for the weight indicated on the motor nameplate.

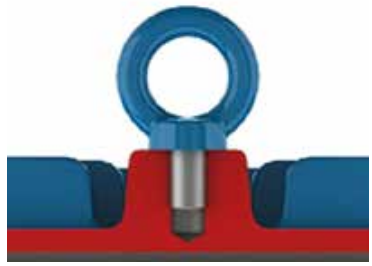

Figure 4.1 *- Correct tightening of the eyebolt*

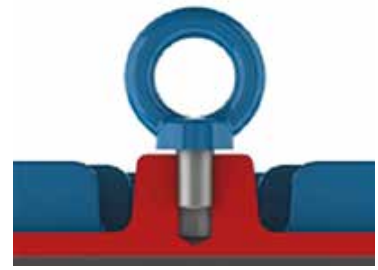

Figure 4.2 *- Incorrect tightening of the eyebolt*

The center-of-gravity may change depending on motor design and accessories. During the lifting procedures the maximum allowed angle of inclination should never be exceeded as specified below.

4.1.1. Horizontal motors with one eyebolt

For horizontal motors fitted with only one eyebolt, the maximum allowed angle-of-inclination during the lifting process should not exceed 30º in relation to the vertical axis, as shown in Figure 4.3.

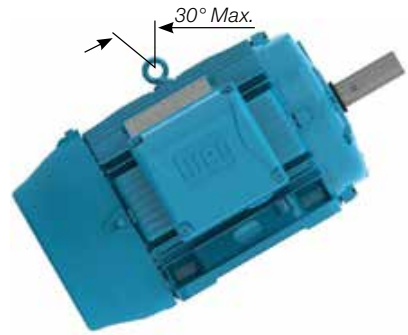

Figure 4.3 *- Maximum allowed angle-of-inclination for motor with one eyebolt*

4.1.2. Horizontal motor with two eyebolts

When motors are fitted with two or more eyebolts, all supplied eyebolts must be used simultaneously for the lifting procedure.

There are two possible eyebolt arrangements (vertical and inclined), as shown below:

- For motors with vertical lifting eyebolts, as shown in Figure 4.4, the maximum allowed lifting angle should not exceed 45° in relation to the vertical axis. We recommend to use a spreader bar for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface;

Figure 4.4 *- Maximum resulting angle for motors with two or more lifting eyebolts*

- For HGF motors, as shown in Figure 4.5, the maximum resulting angle should not exceed 30° in relation to the vertical axis;

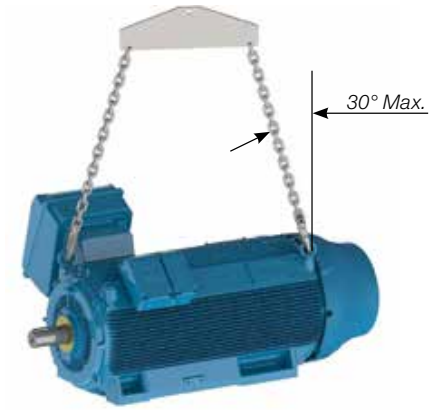

Figure 4.5 *- Maximum resulting angle for horizontal HGF motors*

- For motors fitted with inclined eyebolts, as shown in Figure 4.6, the use of a spreader bar is required for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface.

Figure 4.6 *- Use of a spreader bar for lifting*

4.1.3. Vertical motors

For vertical mounted motors, as shown in Figure 4.7, the use of a spreader bar is required for maintaining the lifting element (chain or rope) in vertical position and thus preventing damage to the motor surface.

Figure 4.7 *- Lifting of vertical mounted motors*

Always use the eyebolts mounted on the top side of the motor, diametrically opposite, considering the mounting position. See Figure 4.8.

Figure 4.8 *- Lifting of HGF motors*

4.1.3.1. Procedures to place W22 motors in the vertical position

For safety reasons during the transport, vertical mounted Motors are usually packed and supplied in horizontal position.
To place W22 motors fitted with eyebolts (see Figure 4.6), to the vertical position, proceed as follows:

1. Ensure that the eyebolts are tightened properly, as shown in Figure 4.1;
2. Remove the motor from the packaging, using the top mounted eyebolts, as shown in Figure 4.9;

Figure 4.9 *- Removing the motor from the packaging*

3. Install a second pair of eyebolts, as shown in Figure 4.10;

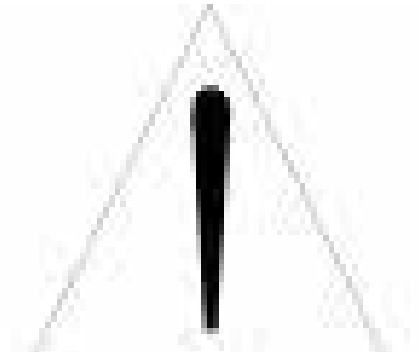

Figure 4.10 *- Installation of the second pair of eyebolts*

4. Reduce the load on the first pair of eyebolts to start the motor rotation, as shown in Figure 4.11. This procedure must be carried out slowly and carefully.

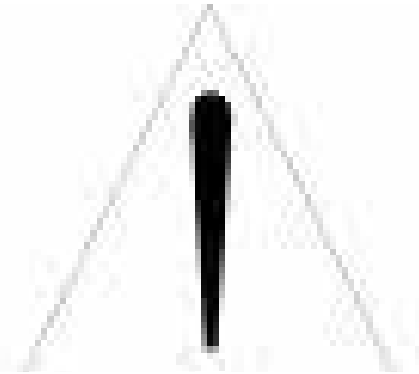

Figure 4.11 *- End result: motor placed in vertical position*

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

4.1.3.2. Procedures to place HGF motors in the vertical position

HGF motors are fitted with eight lifting points: four at drive end and four at non-drive end. The HGF motors are usually transported in horizontal position, however for the installation they must be placed in the vertical position.
To place an HGF motor in the vertical position, proceed as follows:

1. Lift the motor by using the four lateral eyebolts and two hoists, see Figure 4.12;

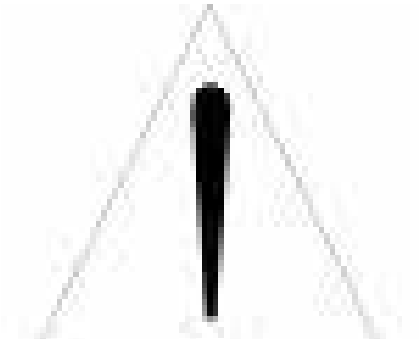

Figure 4.12 *- Lifting HGF motor with two hoists*

2. Lower the hoist fixed to motor drive end while lifting the hoist fixed to motor non-drive end until the motor reaches its equilibrium, see Figure 4.13;

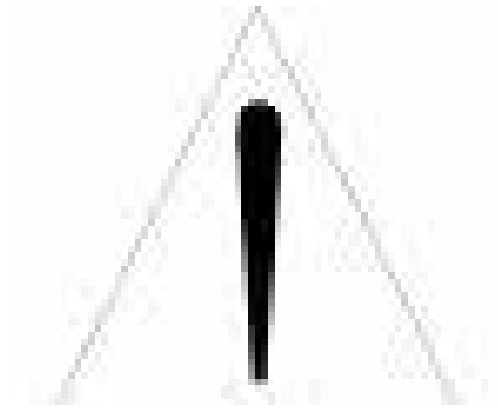

Figure 4.13 *- Placing HGF motor in vertical position*

3. Remove the hoist hooks from the drive end eyebolts and rotate the motor 180° to fix the removed hooks into the two eyebolts at the motor non-drive end, see Figure 4.14;

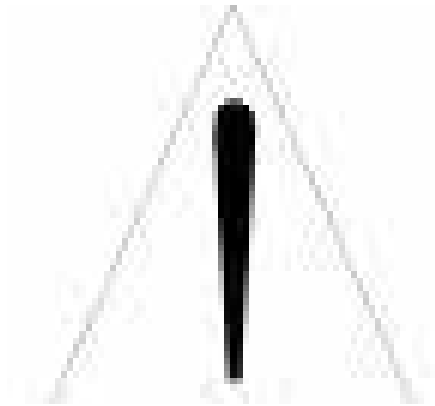

Figure 4.14 *- Lifting HGF motors by the eyebolts at the non-drive end*

4. Fix the removed hoist hooks in the other two eyebolts at the non-drive end and lift the motor until the vertical position is reached, see Figure 4.15.

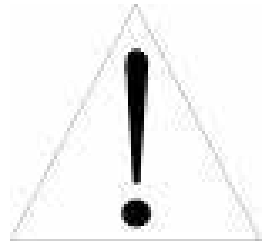

Figure 4.15 *- HGF motor in the vertical position*

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

4.2 Procedures to place W22 vertical mount motors in horizontal position

To place W22 vertical mount motor in horizontal position, proceed as follows:

1. Ensure that all eyebolts are tightened properly, as shown in Figure 4.1;

2. Install the first pair of eyebolts and lift the motor as shown in Figure 4.16;

Figure 4.16 - *Install the first pair of eyebolts*

3. Install the second pair of eyebolts, as shown in Figure 4.17;

Figure 4.17 - *Install the second pair of eyebolts*

4. Reduce the load on the first pair of eyebolts for rotating the motor, as shown in Figure 4.18. This procedure must be carried out slowly and carefully;

Figure 4.18 - *Motor is being rotated to horizontal position*

5. Remove the first pair of eyebolts, as shown in Figure 4.19.

Figure 4.19 - *Final result: motor placed in horizontal position*

5. STORAGE

If the motor is not installed immediately, it must be stored in a dry and clean environment, with relative humidity not exceeding 60%, with an ambient temperature between 5 ºC and 40 ºC, without sudden temperature changes, free of dust, vibrations, gases or corrosive agents. The motor must be stored in horizontal position, unless specifically designed for vertical operation, without placing objects on it. Do not remove the protection grease from shaft end to prevent rust.

If the motor are fitted with space heaters, they must always be turned on during the storage period or when the installed motor is out of operation. Space heaters will prevent water condensation inside the motor and keep the winding insulation resistance within acceptable levels. Store the motor in such position that the condensed water can be easily drained. If fitted, remove pulleys or couplings from the shaft end (more information are given on item 6).

The space heaters should never be energized when the motor is in operation.

5.1. EXPOSED MACHINED SURFACES

All exposed machined surfaces (like shaft end and flange) are factory-protected with temporary rust inhibitor. A protective film must be reapplied periodically (at least every six months), or when it has been removed and/or damaged.

5.2. STORAGE

The stacking height of the motor packaging during the storage period should not exceed 5 m, always considering the criteria indicated in Table 5.1:

Table 5.1 *- Max. recommended stacking height*

Packaging type	Frame sizes	Maximum stacking quantity
Cardboard box	IEC 63 to 132 NEMA 143 to 215	Indicated on the top side of the cardboard box
Wood crate	IEC 63 to 315 NEMA 48 to 504/5	06
	IEC 355 NEMA 586/7 and 588/9	03
	HGF IEC 315 to 630 HGF NEMA 5000 to 9600	Indicated on the packaging

Notes*:*
1) Never stack larger packaging onto smaller packaging;
2) Align the packaging correctly (see Figure 5.1 and Figure 5.2);

Figure 5.1 *- Correct stacking*

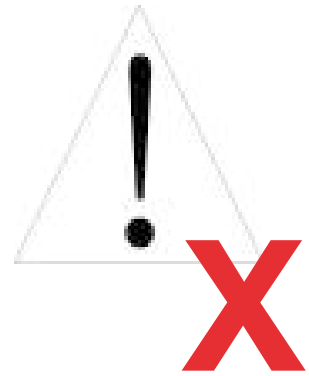

Figure 5.2 *- Incorrect stacking*

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3) The feet of the crates above should always be supported by suitable wood battens (Figure 5.3) and never stand on the steel tape or without support (Figure 5.4);

Figure 5.3 - Correct stacking

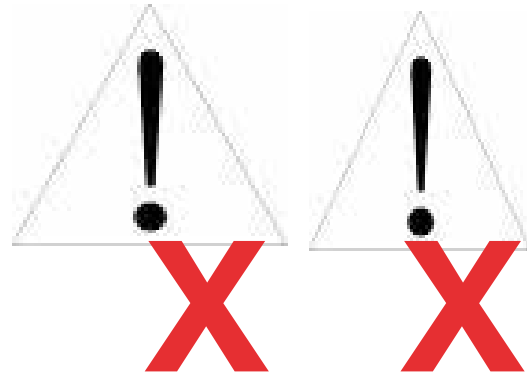


Figure 5.4 - Incorrect stacking

4) When stacking smaller crates onto longer crates, always ensure that suitable wooden supports are provided to withstand the weight (see Figure 5.5). This condition usually occurs with motor packaging above IEC 225S/M (NEMA 364/5T) frame sizes.

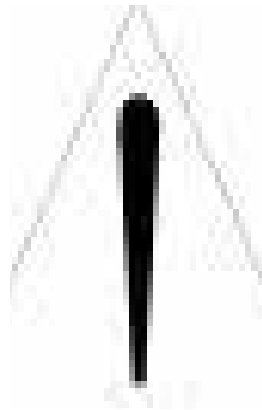


Figure 5.5 *- Use of additional battens for stacking*

5.3 BEARINGS

5.3.1 Grease lubricated bearings

We recommend rotating the motor shaft at least once a month (by hand, at least five revolutions, stopping the shaft at a different position from the original one). If the motor is fitted with shaft locking device, remove it before rotating the shaft and install it again before performing any handling procedure. Vertical motors may be stored in the vertical or in horizontal position. If motors with open bearings are stored longer than six months, the bearings must be relubricated according to item 8.2 before commissioning of the motor.
If the motor is stored for longer than 2 years, the bearings must be replaced or removed, washed, inspected and relubricated according to item 8.2.

5.3.2 Oil lubricated bearings

The motor must be stored in its original operating position and with oil in the bearings. Correct oil level must be ensured. It should be in the center of the sight glass.
During the storage period, remove the shaft locking device and rotate the shaft by hand every month, at least five revolutions, thus achieving an even oil distribution inside the bearing and maintaining the bearing in good operating conditions. Reinstall the shaft locking device every time the motor has to be moved.
If the motor is stored for a period of over six months, the bearings must be relubricated according to Item 8.2 before starting the operation. If the motor is stored for a period of over two years, the bearings must be replaced or removed, washed according to manufacturer instructions, checked and relubricated according to Item 8.2. The oil of vertical mounted motors that are transported in horizontal position is removed to prevent oils leaks during the transport. These motors must be stored in vertical position after receiving and the bearing must be lubricated.

5.3.3 Oil Mist lubricated bearings

The motor must be stored in horizontal position. Lubricate the bearings with ISO VG 68 mineral oil in the amount indicated in the Table 5.2 (this is also valid for bearings with equivalent dimensions). After filling with oil, rotate the shaft by hand, at least five revolutions)
During the storage period, remove the shaft locking device (if any) and rotate the shaft by hand every week, at least five revolutions, stopping it at a different position from the original one. Reinstall the shaft locking device every time the motor has to be moved. If the motor is stored for a period of over two years, the bearings must be replaced or removed, washed according to manufacturer instructions, checked and relubricated according to item 8.2.

Table 5.2 - *Amount of oil per bearing*

Bearing size	Amount of oil (ml)	Bearing size	Amount of oil (ml)
6201	15	6309	65
6202	15	6311	90
6203	15	6312	105
6204	25	6314	150
6205	25	6315	200
6206	35	6316	250
6207	35	6317	300
6208	40	6319	350
6209	40	6320	400
6211	45	6322	550
6212	50	6324	600
6307	45	6326	650
6308	55	6328	700

The oil must always be removed when the motor has to be handled. If the oil mist system is not operating after installation, fill the bearings with oil to prevent bearing rusting. During the storage period, rotate the shaft by hand, at least five revolutions, stopping it at a different position from the original one. Before starting the motor, all bearing protection oil must be drained from the bearing and the oil mist system must be switched ON.

5.3.4 Sleeve bearing

The motor must be stored in its original operating position and with oil in the bearings. Correct oil level must be ensured. It should be in the middle of the sight glass. During the storage period, remove the shaft locking device and rotate the shaft by hand every month, at least five revolutions, and at 30 rpm, thus achieving an even oil distribution inside the bearing and maintaining the bearing in good operating conditions. Reinstall the shaft locking device every time the motor has to be moved.
If the motor is stored for a period of over six months, the bearings must be relubricated according to the Item 8.2 before starting the operation.

If the motor is stored for a period longer than the oil change interval, or if it is not possible to rotate the motor shaft by hand, the oil must be drained and a corrosion protection and dehumidifiers must be applied.

5.4. INSULATION RESISTANCE

We recommend measuring the winding insulation resistance at regular intervals to follow-up and evaluate its electrical operating conditions. If any reduction in the insulation resistance values are recorded, the storage conditions should be evaluated and corrected, where necessary.

5.4.1. Insulation resistance measurement

We recommend measuring the winding insulation resistance at regular intervals to follow-up and evaluate its electrical operating conditions. If any reduction in the insulation resistance values are recorded, the storage conditions should be evaluated and corrected, where necessary.

The insulation resistance must be measured in a safe environment.

The insulation resistance must be measured with a megohmmeter. The machine must be in cold state and disconnected from the power supply.

To prevent the risk of an electrical shock, ground the terminals before and after each measurement. Ground the capacitor (if any) to ensure that it is fully discharged before the measurement is taken.

It is recommended to insulate and test each phase separately. This procedure allows the comparison of the insulation resistance between each phase. During the test of one phase, the other phases must be grounded. The test of all phases simultaneously evaluates the insulation resistance to ground only but does not evaluate the insulation resistance between the phases.
The power supply cables, switches, capacitors and other external devices connected to the motor may considerably influence the insulation resistance measurement. Thus all external devices must be disconnected and grounded during the insulation resistance measurement.
Measure the insulation resistance one minute after the voltage has been applied to the winding. The applied voltage should be as shown in Table 5.3.

Table 5.3 *- Voltage for the insulation resistance*

Winding rated voltage (V)	Testing voltage for measuring the insulation resistance (V)
< 1000	500
1000 - 2500	500 - 1000
2501 - 5000	1000 - 2500
5001 - 12000	2500 - 5000
> 12000	5000 - 10000

The reading of the insulation resistance must be corrected to 40 °C as shown in the Table 5.4.

Table 5.4 *- Correction factor for the insulation resistance corrected to 40 °C*

Measuring temperature of the insulation resistance (°C)	Correction factor of the insulation resistance corrected to 40 °C	Measuring temperature of the insulation resistance (°C)	Correction factor of the insulation resistance corrected to 40 °C
10	0.125	30	0.500
11	0.134	31	0.536
12	0.144	32	0.574
13	0.154	33	0.616
14	0.165	34	0.660
15	0.177	35	0.707
16	0.189	36	0.758
17	0.203	37	0.812
18	0.218	38	0.871
19	0.233	39	0.933
20	0.250	40	1.000
21	0.268	41	1.072
22	0.287	42	1.149
23	0.308	43	1.231
24	0.330	44	1.320
25	0.354	45	1.414
26	0.379	46	1.516
27	0.406	47	1.625
28	0.435	48	1.741
29	0.467	49	1.866
30	0.500	50	2.000

The motor insulation condition must be evaluated by comparing the measured value with the values indicated in Table 5.5 (corrected to 40 °C):

Table 5.5 *- Evaluation of the insulation system*

Limit value for rated voltage up to 1.1 kV (MΩ)	Limit value for rated voltage above 1.1 kV (MΩ)	Situation
Up to 5	Up to 100	Dangerous. The motor can not be operated in this condition
5 to 100	100 to 500	Regular
100 to 500	Higher than 500	Good
Higher than 500	Higher than 1000	Excellent

The values indicated in the table should be considered only as reference values. It is advisable to log all measured values to provide a quick and easy overview on the machine insulation resistance.
If the insulation resistance is low, moisture may be present in the stator windings. In this case the motor should be removed and transported to a WEG authorized Service Center for proper evaluation and repair (This service is not covered by the warranty). To improve the insulation resistance through the drying process, see section 8.4.

6. INSTALLATION

The insulation resistance must be measured in a safe environment.

Check some aspects before proceeding with the installation:

1. Insulation resistance: must be within the acceptable limits. See item 5.4.
2. Bearings:
   a. Rolling bearings: oxidized bearings must be replaced. If no oxidation is detected, lubricate the bearings as described in Item 8.2. If the motor is stored for a period of over two years, the bearings must be replaced before starting the motor;
   b. Sleeve bearing: if sleeve bearing motors are stored longer than the recommended oil change interval, the oil must be changed before machine starting. Don't forget to remove the dehumidifiers when you drain the oil from the motor and to fill it again with new oil before starting the machine. For more details, see item 8.2.
3. Operating conditions of the start capacitors: If single-phase motors are stored for a period of over two years, it is recommended to change the start capacitors before motor starting since they lose their operating characteristics.
4. Terminal box:
   a. the inside of the terminal box must be clean and dry;
   b. the contacts must be correctly connected and corrosion free. See 6.9 and 6.10;
   c. the cable entries must be correctly sealed and the terminal box cover properly mounted in order to ensure the degree of protection indicated on the motor nameplate.
5. Cooling: the cooling fins, air inlet and outlet openings must be clean and unobstructed. The distance between the air inlet openings and the wall should not be shorter than ¼ (one quarter) of the diameter of the air inlet. Ensure sufficient space to perform the cleaning services. See item 7.
6. Coupling: remove the shaft locking device (where fitted) and the corrosion protection grease from the shaft end and flange just before installing the motor. See item 6.4.
7. Drain hole: the motor must always be positioned so the drain hole is at the lowest position (If there is any indication arrow on the drain, the drain must be so installed that the arrow points downwards).
   Motors supplied with rubber drain plugs leave the factory in the closed position and must be opened periodically to allow the exit of condensed water. For environments with high water condensation levels and motor with degree of protection IP55, the drain plugs can be mounted in open position (see Figure 6.1).
   For motors with degree of protection IP56, IP65 or IP66, the drain plugs must remain at closed position (see Figure 6.1), being opened only during the motor maintenance procedures.
   The drain system of motors with Oil Mist lubrication system must be connected to a specific collection system (see Figure 6.12).

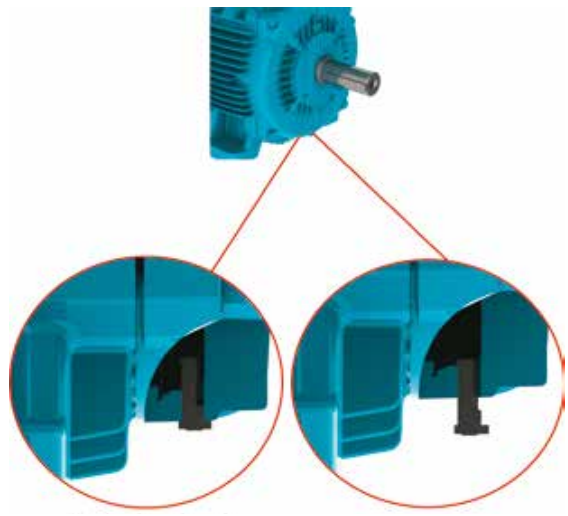


Figure 6.1 *- Detail of the rubber drain plug mounted in closed and open position*

8.Additional recommendations:
a. Check the direction of motor rotation, starting the motor at no-load before coupling it to the load;
b. Vertical mounted motors with shaft end down must be fitted with drip cover to protect them from liquids or solids that may drop onto the motors;
c. Vertical mounted motors with shaft end up must be fitted with water slinger ring to prevent water penetration inside the motor.

Remove or fix the shaft key before starting the motor.

6.1. FOUNDATIONS

The foundation is the structure, structural element, natural or prepared base, designed to withstand the stresses produced by the installed equipment, ensuring safe and stable performance during operation. The foundation design should consider the adjacent structures to avoid the influences of other installed equipment and no vibration is transferred through the structure

The foundation must be flat and its selection and design must consider the following characteristics:

a) The features of the machine to be installed on the foundation, the driven loads, application, maximum allowed deformations and vibration levels (for instance, motors with reduced vibration levels, foot flatness, flange concentricity, axial and radial loads, etc. lower than the values specified for standard motors).

b) Adjacent buildings, conservation status, maximum applied load estimation, type of foundation and fixation and vibrations transmitted by theses constructions.

If the motor is supplied with leveling/alignment bolts, this must be considered in the base design.

Please consider for the foundation dimensioning all stresses that are generated during the operation of the driven load.
The user is responsible for the foundation designing and construction.

The foundation stresses can be calculated by using the following equations (see Figure 6.2):

$$F_1 = 0,5 * g * m - (4 * T_b / A)$$
$$F_2 = 0,5 * g * m + (4 * T_b / A)$$

Where:

F_1 and F_2 = lateral stresses (N);
g = gravitational acceleration (9,8 m/s^2);
m = motor weight (kg);
T_b = breakdown torque (Nm);
A = distance between centerlines of mounting holes in feet or base of the machine (end view) (m).

The motors may be mounted on:
- Concrete bases: are most used for large-size motors (see Figure 6.2);
- Metallic bases: are generally used for small-size motors (see Figure 6.3).

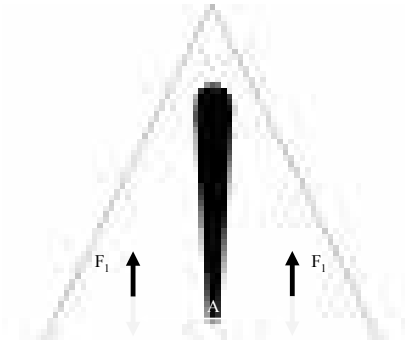


Figure 6.2 *- Motor installed on concrete base*

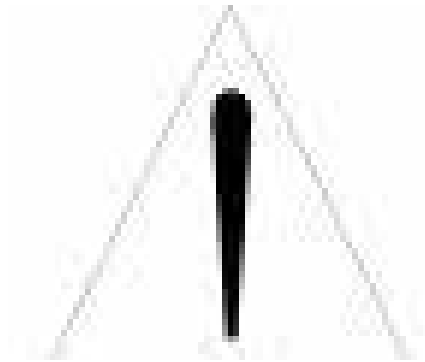


Figure 6.3 *- Motor installed on metallic base*

The metallic and concrete bases may be fitted with sliding system. These types of foundations are generally used where the power transmission is achieved by belts and pulleys. This power transmission system is easier to assemble/disassemble and allows the belt tension adjustment. Other important aspect of this foundation type is the location of the base locking screws that must be diagonally opposite. The rail nearest the drive pulley is placed in such a way that the positioning bolt is between the motor and the driven machine. The other rail must be placed with the bolt on the opposite side (diagonally opposite), as shown in Figure 6.4 .

To facilitate assembly, the bases may have the following features:
- Shoulders and/or recesses;
- Anchor bolts with loose plates;
- Bolts cast in the concrete;
- Leveling screws;
- Positioning screws;
- Steel & cast iron blocks, plates with flat surfaces.

Figure 6.4 *- Motor installed on sliding base*

After completing the installation, it is recommended that all exposed machined surfaces are coated with suitable rust inhibitor.

6.2. MOTOR MOUNTING

Footless motors supplied with transportation devices, according to Figure 6.5, must have their devices removed before starting the motor installation.

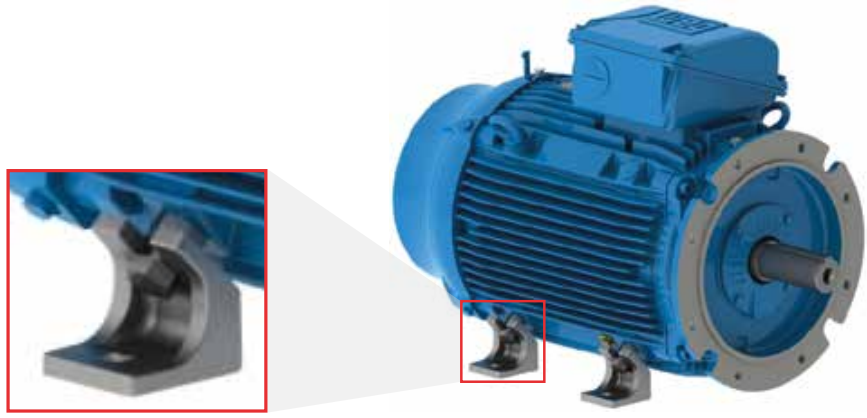


Figure 6.5 *- Detail of the transportation devices for footless motors*

6.2.1. Foot mounted motors

The drawings of the mounting hole dimensions for NEMA or IEC motors can be checked in the respective technical catalogue.
The motor must be correctly aligned and leveled with the driven machine. Incorrect alignment and leveling may result in bearing damage, generate excessive vibration and even shaft distortion/breakage.
For more details, see section 6.3 and 6.6. The thread engagement length of the mounting bolt should be at least 1.5 times the bolt diameter. This thread engagement length should be evaluated in more severe applications and increased accordingly.
Figure 6.6 shows the mounting system of a foot mounted motor indicating the minimum required thread engagement length.

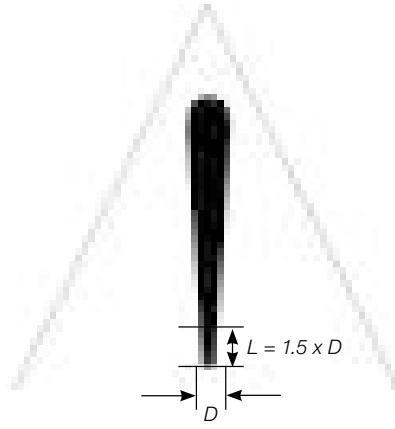


Figure 6.6 *- Mounting system of a foot mounted motor*

6.2.2. Flange mounted motors

The drawings of the flange mounting dimensions, IEC and NEMA flanges, can be checked in the technical catalogue.
The coupling of the driven equipment to the motor flange must be properly dimensioned to ensure the required concentricity of the assembly.
Depending on the flange type, the mounting can be performed from the motor to the driven equipment flange (flange FF (IEC) or D (NEMA)) or from the driven equipment flange to the motor (flange C (DIN or NEMA)).
For the mounting process from the driven equipment flange to the motor, you must consider the bolt length, flange thickness and the thread depth of the motor flange.

If the motor flange has tapped through-holes, the length of the mounting bolts must not exceed the tapped through-hole length of the motor flange, thus preventing damage to the winding head.

For flange mounting the thread engagement length of the mounting bolt should be at least 1.5 times the bolt diameter. In severe applications, longer thread engagement length may be required.
In severe applications or if large motors are flange mounted, a foot or pad mounting may be required in addition to the flange mounting (Figure 6.7). The motor must never be supported on its cooling fins.

Figure 6.7 *- Mounting method of flange mounted motors with frame base support*

Note*:*
When liquid (for example oil) is likely to come into contact with the shaft seal, please contact your local WEG representative.

6.2.3. Pad mounted motors

Typically, this method of mounting is used in axial fans. The motor is fixed by tapped holes in the frame. The dimensions of these tapped holes can be checked in the respective product catalogue. The selection of the motor mounting rods/bolts must consider the dimensions of the fan case, the installation base and the thread depth in the motor frame.
The mounting rods and the fan case wall must be sufficiently stiff to prevent the transmission of excessive vibration to the machine set (motor & fan). Figure 6.8 shows the pad mounting system.

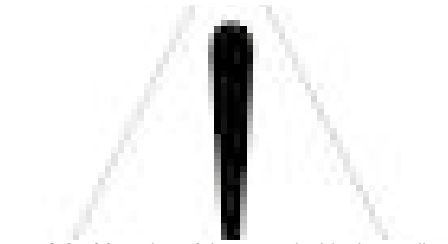


Figure 6.8 *- Mounting of the motor inside the cooling duct*

6.3. BALANCING

Unbalanced machines generate vibration which can result in damage to the motor. WEG motors are dynamically balanced with “half key” and without load (uncoupled). Special balancing quality level must be stated in the Purchase Order.

The transmission elements, such as pulleys, couplings, etc., must balanced with “half key” before they are mounted on the motor shaft.

The balance quality grade meets the applicable standards for each product line.

The maximum balancing deviation must be recorded in the installation report.

6.4. COUPLINGS

Couplings are used to transmit the torque from the motor shaft to the shaft of the driven machine. The following aspects must be considered when couplings are installed:

- Use proper tools for coupling assembly & disassembly to avoid damages to the motor and bearings;
- Whenever possible, use flexible couplings, since they can absorb eventual residual misalignments during the machine operation;
- The maximum loads and speed limits informed in the coupling and motor manufacturer catalogues cannot be exceeded;
- Level and align the motor as specified in sections 6.5 and 6.6, respectively.

Remove or fix the shaft key firmly when the motor is operated without coupling in order to prevent accidents.

6.4.1. Direct coupling

Direct coupling is characterized when the Motor shaft is directly coupled to the shaft of the driven machine without transmission elements. Whenever possible, use direct coupling due to lower cost, less space required for installation and more safety against accidents.

Do not use roller bearings for direct coupling, unless sufficient radial load is expected.

6.4.2. Gearbox coupling

Gearbox coupling is typically used where speed reduction is required.
Make sure that shafts are perfectly aligned and strictly parallel (in case of straight spur gears) and in the right meshing angle (in case of bevel and helical gears).

6.4.3. Pulley and belt coupling

Pulleys and belts are used when speed increase or reduction between motor shaft and driven load is required.

Excessive belt tension will damage the bearings and cause unexpected accidents such as breakage of the motor shaft.

6.4.4. Coupling of sleeve bearing motors

Motors designed with sleeve bearings must be operated with direct coupling to the driven machine or a gearbox. Pulley and belts can not be applied for sleeve bearing motors.

Motors designed with sleeve bearings have 3 (three) marks on the shaft end. The center mark is the indication of the magnetic center and the 2 (two) outside marks indicate the allowed limits of the rotor axial movement, as shown in Figure 6.9.
The motor must be so coupled that during operation the arrow on the frame is placed over the central mark indicating the rotor magnetic center. During start-up, or even during operation, the rotor may freely move between the two outside marks when the driven machine exerts an axial load on the motor shaft. However, under no circumstance, the motor can operate continuously with axial forces on the bearing.

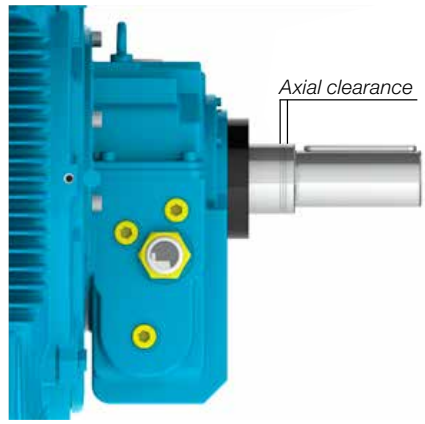


Figure 6.9 *- Axial clearance of motor designed with sleeve bearing*

For coupling evaluation consider the maximum axial bearing clearance as shown in Table 6.1.
The axial clearance of the driven machine and coupling influence the maximum bearing clearance.

Table 6.1 *- Clearance used for sleeve bearings*

Bearing size	Total axial clearance (mm)
9*	3 + 3 = 6
11*	4 + 4 = 8
14*	5 + 5 =10
18	7,5 + 7,5 = 15

** For Motors in accordance with API 541, the total axial clearance is 12.7 mm*

The sleeve bearings used by WEG were not designed to support axial load continuously.
Under no circumstance must the motor be operated continuously at its axial clearance limits.

6.5. LEVELING

The motor must be leveled to correct any deviations in flatness arising from the manufacturing process and the material structure rearrangement. The leveling can be carried out by a leveling screw fixed on the motor foot or on the flange or by means of thin compensation shims. After the leveling process, the leveling height between the motor mounting base and the motor cannot exceed 0.1 mm.
If a metallic base is used to level the height of the motor shaft end and the shaft end of the driven machine, level only the metallic base relating to the concrete base.

Record the maximum leveling deviations in the installation report.

6.6. ALIGNMENT

The correct alignment between the motor and the driven machine is one of the most important variables that extends the useful service life of the motor. Incorrect coupling alignment generates high loads and vibrations reducing the useful life of the bearings and even resulting in shaft breakages. Figure 6.10 illustrates the misalignment between the motor and the driven machine.

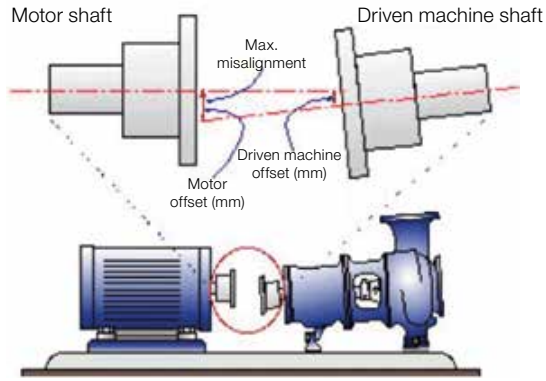
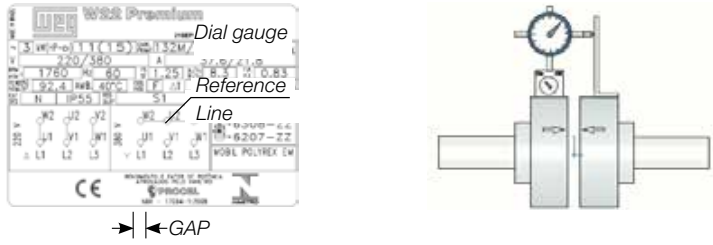


Figure 6.10 *- Typical misalignment condition*

Alignment procedures must be carried out using suitable tools and devices, such as dial gauge, laser alignment instruments, etc.. The motor shaft must be aligned axially and radially with the driven machine shaft.

The maximum allowed eccentricity for a complete shaft turn should not exceed 0.03 mm, when alignment is made with dial gauges, as shown in Figure 6.11. Ensure a gap between couplings to compensate the thermal expansion between the s*Dial gauge* specified by the coupling manufacturer.



Parallel alignment *Angular alignment*

Figure 6.11 *- Alignment with dial gauge*

If alignment is made by a laser instrument, please consider the instructions and recommendations provided by the laser instrument manufacturer.
The alignment should be checked at ambient temperature with machine at operating temperature.

The coupling alignment must be checked periodically.

Pulley and belt couplings must be so aligned that the driver pulley center lies in the same plane of the driven pulley center and the motor shaft and the shaft of the driven machine are perfectly parallel.
After completing the alignment procedures, ensure that mounting devices do not change the motor and machine alignment and leveling resulting into machine damage during operation.

It is recommended to record the maximum alignment deviation in the Installation Report.

6.7. CONNECTION OF OIL LUBRICATED OR OIL MIST LUBRICATED MOTORS

When oil lubricated or oil mist lubricated motors are installed, connect the existing lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12. The lubrication system must ensure continuous oil flow through the bearings as specified by the manufacturer of the installed lubrication system.

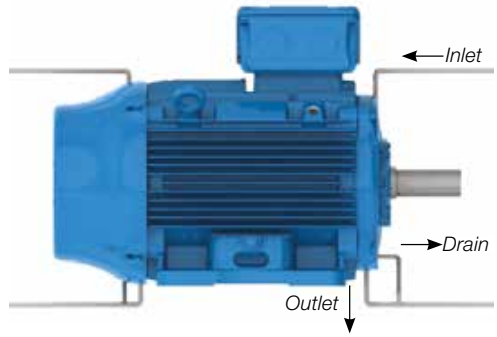


Figure 6.12 *- Oil supply and drain system of oil lubricated or oil mist lubricated motors*

6.8. CONNECTION OF THE COOLING WATER SYSTEM

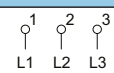
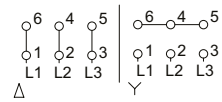
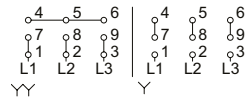
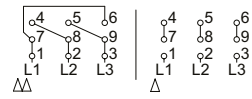
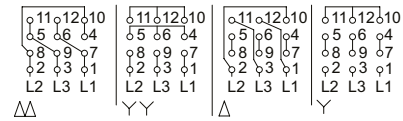
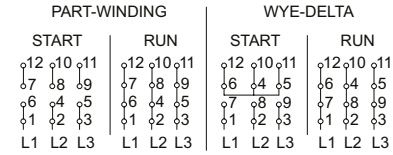
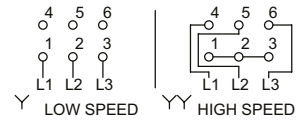
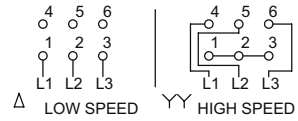
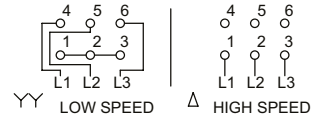
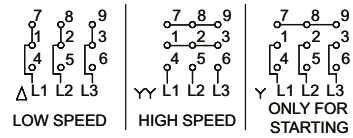
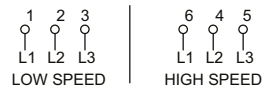
When water cooled motors are installed, connect the water inlet and outlet tubes to ensure proper motor cooling. According to item 7.2, ensure correct cooling water flow rate and water temperature in the motor cooling system.

6.9. ELECTRICAL CONNECTION

Consider the rated motor current, service factor, starting current, environmental and installation conditions, maximum voltage drop, etc. to select appropriate power supply cables and switching and protection devices. All motors must be installed with overload protection systems. Three-phase motors should be fitted with phase fault protection systems.

Before connecting the motor, check if the power supply voltage and the frequency comply with the motor nameplate data. All wiring must be made according to the connection diagram on the motor nameplate. Please consider the connection diagrams in the Table 6.2 as reference value.
To prevent accidents, check if motor has been solidly grounded in accordance with the applicable standards.

Table 6.2 - *Typical connection diagram for three-phase motors.*

Configuration	Quantity of leads	Type of connection	Connection diagram
Single speed	3	-	
	6	Δ - Y	
	9	YY - Y	
		ΔΔ - Δ	
	12	ΔΔ - YY - Δ - Y	
		Δ - PWS Part-winding start	
Double speed Dahlander	6	YY - Y Variable Torque	
		Δ - YY Constant Torque	
		YY - Δ Constant Output	
	9	Δ - Y - YY	
Double speed Double winding	6	-	

Equivalent table for lead identification													
Lead identification on the wiring diagram		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Single speed	NEMA MG 1 Part 2	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
	IEC 60034-8	U1	V1	W1	U2	V2	W2	U3	V3	W3	U4	V4	W4
	JIS (JEC 2137) - up to 6 terminals	U	V	W	X	Y	Z						
	JIS (JEC 2137) - above 6 terminals	U1	V1	W1	U2	V2	W2	U5	V5	W5	U6	V6	W6
Double speed (Dahlander / Double winding)	NEMA MG 1 Part 2[1)]	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W
	IEC 60034-8	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W
	JIS (JEC 2137)	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W

1) NEMA MG 1 Part 2 defines T1 to T12 for two or more winding, however WEG adopts 1U to 4W.

If motors are supplied without terminal blocks, insulate the cable terminals with suitable insulation material that meets the power supply voltage and the insulation class indicated on the motor nameplate.

Ensure correct tightening torque for the power cable and grounding connections as specified in Table 8.7

The clearance distance (see Figure 6.13) between non-insulated live parts with each other and between grounded parts must be as indicated in Table 6.3.

Figure 6.13 *- Clearance distance representation*

Table 6.3 *- Minimum clearance distance (mm) x supply voltage*

Voltage	Minimum clearance distance (mm)
U ≤ 440 V	4
440 < U ≤ 690 V	5.5
690 < U ≤ 1000 V	8
1000 < U ≤ 6900 V	45
6900 < U ≤ 11000 V	70
11000 < U ≤ 16500 V	105

Even when the motor is off, dangerous voltages may be present inside the terminal box used for the space heater supply or winding energization when the winding is used as heating element.
Motor capacitors will hold a charge even after the power has been cut off. Do not touch the capacitors and/or motor terminals, before discharging the capacitors completely.

After the motor connection has been completed, ensure that no tool or foreign body has been left inside the terminal box.

Unused cable inlet holes in the terminal box must be properly closed to ensure the degree of protection indicated on the motor nameplate.
The cable inlets used for power supply and control must be fitted with components (for example, cable-glands and conduits) that meet the applicable standards and regulations in each country.

If the motor is fitted with accessories, such as brakes and forced cooling systems, these devices must be connected to the power supply according to the information provided on their nameplates and with special care as indicated above.

All protection devices, including overcurrent protection, must be set according to the rated machine conditions. These protection devices must protect the machine against short circuit, phase fault or locked rotor condition. The motor protection devices must be set according to the applicable standards.

Check the direction of rotation of the motor shaft. If there is no limitation for the use of unidirectional fans, the shaft rotation direction can be changed by reversing any two of the phase connections. For single-phase motor, check the connection diagram indicated on the motor nameplate.

6.10. CONNECTION OF THE THERMAL PROTECTION DEVICES

If the motor is supplied with temperature monitoring devices, such as, thermostat, thermistors, automatic thermal protectors, Pt-100 (RTD), etc., they must be connected to the corresponding control devices as specified on the accessory nameplates. The non-compliance with this procedure may void the product warranty and cause serious material damages.

Do not apply test voltage above 2.5 V on thermistors and current above 1 mA on RTDs (Pt-100) according to IEC 60751 standard.

Figure 6.14 and Figure 6.15 show the connection diagram of the bimetal thermal protector (thermostats) and thermistors, respectively.

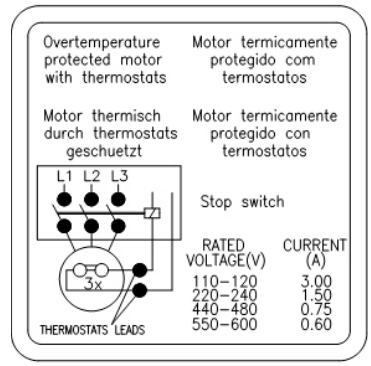


Figure 6.14 *- Connection of the bimetal thermal protectors (thermostats)*

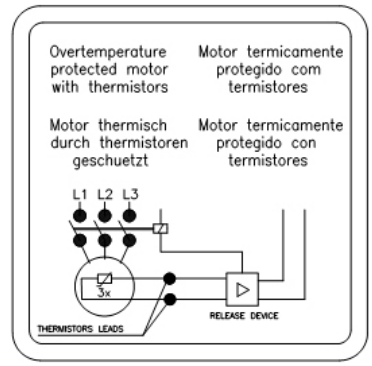


Figure 6.15 *- Thermistor connection*

The alarm temperature limits and thermal protection shutdowns can be defined according to the application; however these temperature limits can not exceed the values in Table 6.4.

Table 6.4 *- Maximum activation temperature of the thermal protections*

Component	Insulation class	Maximum temperature of the protection setting (°C)	
		Alarm	Tripping
Winding	B	-	130
	F	130	155
	H	155	180
Bearing	All	110	120

Notes*:*

1) The number and type of the installed protection devices are stated on the accessory nameplate of the motor.

2) If the motor is supplied with calibrated resistance, (for example, Pt-100), the motor protection system must be set according to the operating temperatures indicated in Table 6.4.

6.11. RESISTANCE TEMPERATURE DETECTORS (PT-100)

The thermocouples Pt-100 are made of materials, whose resistance depends on the temperature variation, intrinsic property of some materials (usually platinum, nickel or copper), calibrated resistance. Its operation is based on the principle that the electric resistance of a metallic conductor varies linearly with the temperature, thus allowing a continuous monitoring of the motor warm-up through the controller display ensuring a high level of precision and answer stability. These devices are widely used for measuring temperatures in various industry sectors.

In general these devices are used in installations where precise temperature control is required, for example, in installation for irregular or intermittent duty.

The same detector may be used for alarm and tripping purposes.

Table 6.5 and Figure 6.16 show the equivalence between the Pt-100 resistance and the temperature.

Table 6.5 - Equivalence between the Pt-100 resistance and the temperature

°C	Ω	°C	Ω	°C	Ω	°C	Ω	°C	Ω
-29	88.617	17	106.627	63	124.390	109	141.908	155	159.180
-28	89.011	18	107.016	64	124.774	110	142.286	156	159.553
-27	89.405	19	107.404	65	125.157	111	142.664	157	159.926
-26	89.799	20	107.793	66	125.540	112	143.042	158	160.298
-25	90.193	21	108.181	67	125.923	113	143.420	159	160.671
-24	90.587	22	108.570	68	126.306	114	143.797	160	161.043
-23	90.980	23	108.958	69	126.689	115	144.175	161	161.415
-22	91.374	24	109.346	70	127.072	116	144.552	162	161.787
-21	91.767	25	109.734	71	127.454	117	144.930	163	162.159
-20	92.160	26	110.122	72	127.837	118	145.307	164	162.531
-19	92.553	27	110.509	73	128.219	119	145.684	165	162.903
-18	92.946	28	110.897	74	128.602	120	146.061	166	163.274
-17	93.339	29	111.284	75	128.984	121	146.438	167	163.646
-16	93.732	30	111.672	76	129.366	122	146.814	168	164.017
-15	94.125	31	112.059	77	129.748	123	147.191	169	164.388
-14	94.517	32	112.446	78	130.130	124	147.567	170	164.760
-13	94.910	33	112.833	79	130.511	125	147.944	171	165.131
-12	95.302	34	113.220	80	130.893	126	148.320	172	165.501
-11	95.694	35	113.607	81	131.274	127	148.696	173	165.872
-10	96.086	36	113.994	82	131.656	128	149.072	174	166.243
-9	96.478	37	114.380	83	132.037	129	149.448	175	166.613
-8	96.870	38	114.767	84	132.418	130	149.824	176	166.984
-7	97.262	39	115.153	85	132.799	131	150.199	177	167.354
-6	97.653	40	115.539	86	133.180	132	150.575	178	167.724
-5	98.045	41	115.925	87	133.561	133	150.950	179	168.095
-4	98.436	42	116.311	88	133.941	134	151.326	180	168.465
-3	98.827	43	116.697	89	134.322	135	151.701	181	168.834
-2	99.218	44	117.083	90	134.702	136	152.076	182	169.204
-1	99.609	45	117.469	91	135.083	137	152.451	183	169.574
0	100.000	46	117.854	92	135.463	138	152.826	184	169.943
1	100.391	47	118.240	93	135.843	139	153.200	185	170.313
2	100.781	48	118.625	94	136.223	140	153.575	186	170.682
3	101.172	49	119.010	95	136.603	141	153.950	187	171.051
4	101.562	50	119.395	96	136.982	142	154.324	188	171.420
5	101.953	51	119.780	97	137.362	143	154.698	189	171.789
6	102.343	52	120.165	98	137.741	144	155.072	190	172.158
7	102.733	53	120.550	99	138.121	145	155.446	191	172.527
8	103.123	54	120.934	100	138.500	146	155.820	192	172.895
9	103.513	55	121.319	101	138.879	147	156.194	193	173.264
10	103.902	56	121.703	102	139.258	148	156.568	194	173.632
11	104.292	57	122.087	103	139.637	149	156.941	195	174.000
12	104.681	58	122.471	104	140.016	150	157.315	196	174.368
13	105.071	59	122.855	105	140.395	151	157.688	197	174.736
14	105.460	60	123.239	106	140.773	152	158.061	198	175.104
15	105.849	61	123.623	107	141.152	153	158.435	199	175.472
16	106.238	62	124.007	108	141.530	154	158.808	200	175.840

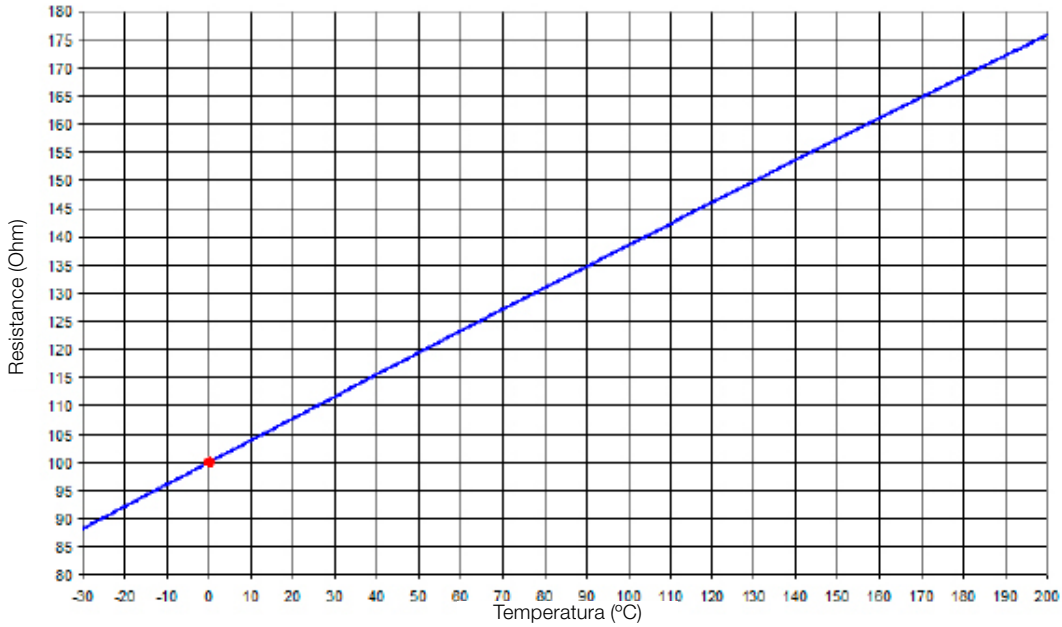


Figure 6.16 *- Ohmic resistance of the Pt-100 x temperature*

6.12. CONNECTION OF THE SPACE HEATERS

Before switching ON the space heaters, check if the space heaters connection have been made according to the connection diagram shown on the space heater nameplate. For motors supplied with dual voltage space heaters (110-127/220-240 V), see Figure 6.17.

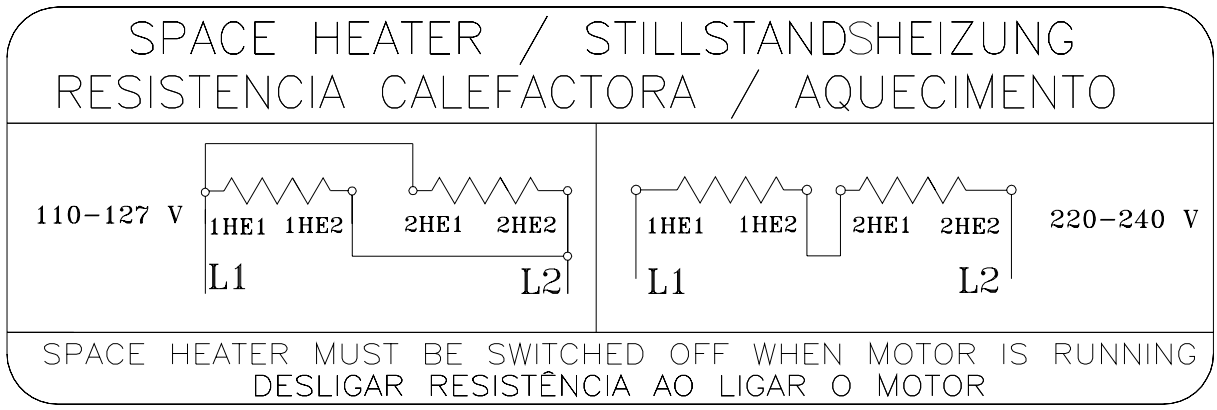


Figure 6.17 *- Dual voltage space heater connection*

The space heaters should never be energized when the motor is in operation.

6.13. STARTING METHODS

Whenever possible, the motor starting must be Direct On Line (DOL) at rated voltage. This is the most simple and feasible starting method. However, it must only be applied when the starting current does not affect the power supply. Please consider the local electric utility regulations when installing a motor.
High inrush current may result in:
a) high voltage drop in the power supply line creating unacceptable line disturbance on the distribution system;
b) requiring oversized protection system (cables and contactor) increasing the installation costs.

If DOL starting is not allowed due to the reasons mentioned above, an indirect starting method compatible with the load and motor voltage to reduce the starting current may be used.
If reduced voltage starters are used for starting, the motor starting torque will also be reduced.

Table 6.6 shows the possible indirect starting methods that can be used depending on the number of the motor leads.

Table 6.6 *- Starting method x number of motor leads*

Number of leads	Possible starting methods
3 leads	Autotransformer Soft-starter
6 leads	Star-Delta Autotransformer Soft-starter
9 leads	Series/Parallel Part winding Autotransformer Soft-starter
12 leads	Star-Delta Series/Parallel Part winding Autotransformer Soft-starter

Table 6.7 shows examples of possible indirect starting methods to be used according to the voltage indicated on the motor nameplate and the power supply voltage.

Table 6.7 *- Starting methods x voltage*

Nameplate voltage	Operating voltage	Star-delta	Autotransformer starting	Starting by series/ parallel switch	Part-winding starting	Starting by Soft-starter
220/380 V	220 V 380 V	YES NO	YES YES	NO NO	NO NO	YES YES
220/440 V	220 V 440 V	NO NO	YES YES	YES NO	YES NO	YES YES
230/460 V	230 V 460 V	NO NO	YES YES	YES NO	YES NO	YES YES
380/660 V	380 V	YES	YES	NO	NO	YES
220/380/440 V	220 V 380 V 440 V	YES NO YES	YES YES YES	YES YES NO	YES YES NO	YES YES YES

The WQuattro line motors must be started direct on-line (DOL) or driven by a frequency inverter in scalar mode.

6.14. MOTORS DRIVEN BY FREQUENCY INVERTER

The operation with frequency inverter must be stated in the Purchase Order since this drive type may require some changes of the motor design.

Wmagnet Motors must only be driven by WEG frequency inverter.

The frequency inverter used to drive motors up to 690 V must be fitted with Pulse With Modulation (PWM) with vector control.

When a motor is driven by a frequency inverter at lower frequencies than the rated frequency, you must reduce the motor torque to prevent motor overheating. The torque reduction (derating torque) can be found in the item 6.4 of the "Technical Guidelines for Induction Motors driven by PWM Frequency inverters" available on the site www.weg.net.

If the motor is operated above the rated frequency, please note:
- That the motor must be operated at constant output;
- That the motor can supply max. 95% of its rated output;
- Do not exceed the maximum speed and please consider:
  - max. operating frequency stated on the additional nameplate;
  - mechanical speed limitation of the motor.

Information on the selection of the power cables between the frequency inverter and the motor can be found in the item 6.4 of the "Technical Guidelines for Induction Motors driven by PWM Frequency inverters" available at www.weg.net.

6.14.1. Use of dV/dt filter

6.14.1.1. Motor with enameled round wire

Motors designed for rated voltages up to 690 V, when driven by frequency inverter, do not require the use of dV/dT filters, provided that following criteria are considered.

Criteria for the selection of motors with round enameled wire when driven by frequency inverter [1]				
Motor rated votage [2]	**Peak voltage at the motor terminals (max)**	**dV/dt inverter output (max)**	**Inverter Rise Time [3] (min.)**	**MTBP [3] Time between pulses (min)**
Vnom ≤ 460 V	≤ 1600 V	≤ 5200 V/µs	≥ 0,1 µs	≥ 6 µs
460 < Vnom ≤ 575 V	≤ 1800 V	≤ 6500 V/µs		
575 < Vnom ≤ 690 V [4]	≤ 1600 V	≤ 5200 V/µs		
575 < Vnom ≤ 690 V [5]	≤ 2200 V	≤ 7800 V/µs		

***Notes**:*
1. For the application of motors with round enameled wires designed for 690 < Vnom ≤ 1100 V, please contact WEG.
2. For the application of dual voltage motors, example 380/660 V, consider the lower voltage (380 V).
3. Information supplied by the inverter manufacturer.
4. When not stated in the Purchase Order that the motor will be driven by frequency inverter.
5. When stated in the Purchase Order that the motor will be driven by frequency inverter.

6.14.1.2. Motor with prewound coils

Motors with prewound coils (medium and high voltage motors regardless of frame sizes, and low voltage motors from IEC 500 / NEMA 800 frame on), designed for the use with frequency inverters, do not require the use of filters, provided they comply with the criteria in Table 6.8.

***Table 6.8** - Criteria to be considered when using motor with prewound coils to be drive by frequency inverters*

Motor rated voltage	**Type of modulation**	**Turn to turn insulation (phase-phase)**		**Phase-ground insulation**	
		Peak voltage at the motor terminals	**dV/dt at the motor terminals**	**Peak voltage at the motor terminals**	**dV/dt at the motor terminals**
690 < Vnom ≤ 4160 V	Sinusoidal	≤ 5900 V	≤ 500 V/µs	≤ 3400 V	≤ 500 V/µs
	PWM	≤ 9300 V	≤ 2700 V/µs	≤ 5400 V	≤ 2700 V/µs
4160 < Vnom ≤ 6600 V	Sinusoidal	≤ 9300 V	≤ 500 V/µs	≤ 5400 V	≤ 500 V/µs
	PWM	≤ 14000 V	≤ 1500 V/µs	≤ 8000 V	≤ 1500 V/µs

6.14.2. Bearing insulation

Only the motors in IEC frame size 400 (NEMA 680) and larger are supplied, as standard, with insulated bearing. If motor must be driven by frequency inverter, insulate the bearing according to Table 6.9.

Table 6.9 *- Recommendation on the bearing insulation for inverter driven motors*

Frame size	Recommendation
IEC 315 and 355 NEMA 445/7, 447/9, L447/9, 504/5, 5006/7/8, 5009/10/11, 586/7, 5807/8/9, 5810/11/12 and 588/9	■ Insulated bearing/end shield ■ Grounding between shaft and frame by grounding brush
IEC 400 and larger NEMA 680 and larger	■ Insulated NDE bearing ■ Grounding between shaft and frame by grounding brush

When motors are supplied with shaft grounding system, monitor the grounding brush constantly during its operation and, when it reaches the end of its useful life, it must be replaced by another brush with the same specification.

6.14.3. Switching frequency

The minimum inverter switching frequency must not be lower than 2.5 kHz and should not exceed 5 kHz.

The non-compliance with the criteria and recommendations indicated in this manual may void the product warranty.

6.14.4. Mechanical speed limitation

Table 6.10 shows the maximum speeds allowed for motors driven by frequency inverter.

Table 6.10 *- Maximum motor speed (in rpm)*

Frame size		DE-bearing	Maximum speed for standard motors
IEC	NEMA		
63-90	143/5	6201 6202 6203 6204 6205	10400
100	-	6206	8800
112	182/4	6207	7600
		6307	6800
132	213/5	6308	6000
160	254/6	6309	5300
180	284/6	6311	4400
200	324/6	6312	4200
225-630	364/5-9610	6314	3600
		6315	3600
		6316	3200
		6319	3000
		6220	3600
		6320	2200
		6322	1900
		6324	1800
		6328	1800
		6330	1800

Note:
To select the maximum allowed motor speed, consider the motor torque derating curve.

For more information on the application of frequency inverters, contact WEG or check the “Technical Guidelines for Induction Motors driven by PWM Frequency inverters” available at www.weg.net.

7. COMMISSIONING

7.1. INITIAL START-UP

After finishing the installation procedures and before starting the motor for the first time or after a long period without operation, the following items must be checked:

- If the nameplate data (voltage, current, connection diagram, degree of protection, cooling system, service factor, etc.) meet the application requirements;
- If the machine set (motor + driven machine) has been mounted and aligned correctly;
- If the motor driving system ensures that the motor speed does not exceed the max. allowed speed indicated in Table 6.10;
- Measure the winding insulation resistance, making sure it complies with the specified values in item 5.4;
- Check the motor rotation direction;
- Inspect the motor terminal box for damage and ensure that it is clean and dry and all contacts are rust-free, the seals are in perfect operating conditions and all unused threaded holes are properly closed thus ensuring the degree of protection indicated on the motor nameplate;
- Check if the motor wiring connections, including grounding and auxiliary equipment connection, have been carried out properly and are in accordance with the recommendations in item 6.9;
- Check the operating conditions of the installed auxiliary devices (brake, encoder, thermal protection device, forced cooling system, etc.);
- Check bearing operating conditions. If signs of oxidation are detected, replace the bearings. If no sign of oxidation is detected, relubricate the bearings as described in item 8.2. If the motors are stored for more than two years, the bearings must be replaced before starting the motor;
- When motors are fitted with sleeve bearings, ensure:
  - Correct oil level for the sleeve bearing. The oil level should be in the center of the sight glass (see Figure 6.8);
  - That the motor is not started or operated with axial or radial loads;
  - That if the motor is stored for a period equal or longer than the oil change interval, the oil must be changed before starting the motor.
- Inspect the capacitor operating condition, if any. If motors are installed for more than two years, but were never commissioned, it is recommended to change the start capacitors since they lose their operating characteristics;
- Ensure that the air inlet and outlet opening are not blocked. The minimum clearance to the nearest wall (L) should be at least ¼ of the fan cover diameter (D), see Figure 7.1. The intake air temperature must be at ambient temperature.

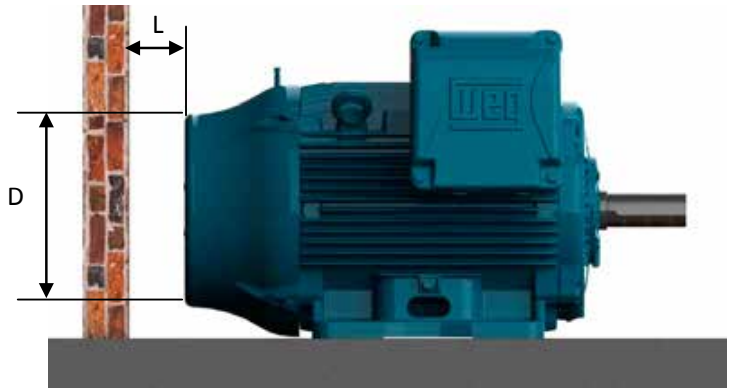


***Figure 7.1**- Minimum clearance to the wall*

Please consider the minimum distances shown in the Table 7.1 as reference value;

Table 7.1 *- Minimum distance between the fan cover and wall*

Frame size		Distance between the fan cover and the wall (L)	
IEC	**NEMA**	**mm**	**inches**
63	-	25	0.96
71	-	26	1.02
80	-	30	1.18
90	143/5	33	1.30
100	-	36	1.43
112	182/4	41	1.61
132	213/5	50	1.98
160	254/6	65	2.56
180	284/6	68	2.66
200	324/6	78	3.08
225 250	364/5 404/5	85	3.35
280	444/5 445/7 447/9	108	4.23
315	L447/9 504/5 5006/7/8 5009/10/11	122	4.80
355	586/7 588/9 5807/8/9 5810/11/12	136	5.35
400	6806/7/8 6809/10/11	147	5.79
450	7006/10	159	6.26
500	8006/10	171	6.73
560	8806/10	185	7.28
630	9606/10	200	7.87

- Ensure correct water flow rate and water temperature when water cooled motors are used. See item 7.2;
- Ensure that all rotating parts, such as pulleys, couplings, external fans, shaft, etc. are protected against accidental contact.

Other tests and inspections not included in the manual may be required, depending on the specific installation, application and/or motor characteristics.

After all previous inspections have been carried out, proceed as follows to start the motor:

- Start the motor on no-load (if possible) and check the motor direction of rotation. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions;
- Ensure the motor starts smoothly. If any abnormal operating condition is noticed, switch off the motor, check the assembly system and connections before the motor is started again;
- If excessive vibrations are noticed, check if the motor mounting bolts are well tightened or if the vibrations are not generated and transmitted from adjacent installed equipment. Check the motor vibration periodically and ensure that the vibration limits are as specified in item 7.2.1;
- Start the motor at rated load during a short time and compare the operating current with the rated current indicated on the nameplate;
- Continue to measure the following motor variables until thermal equilibrium is reached: current, voltage, bearing and motor frame temperature, vibration and noise levels;
- Record the measured current and voltage values on the Installation Report for future comparisons.

As induction motors have high inrush currents during start-up, the acceleration of high inertia load requires an extended starting time to reach full speed resulting in fast motor temperature rise. Successive starts within short intervals will result in winding temperature increases and can lead to physical insulation damage reducing the useful life of the insulation system. If the duty cycle S1 / CONT. is specified on the motor nameplate, this means that the motor has been designed for:

- Two successive starts: first start from cold condition, i. e., the motor windings are at room temperature and the second start immediately after the motor stops;
- One start from hot condition, i. e., the motor windings are at rated temperature.

The Troubleshooting Chart in section 10 provides a basic list of unusual cases that may occur during motor operation with the respective corrective actions.

7.2. OPERATING CONDITIONS

Unless otherwise stated in the Purchase Order, electric motors are designed and built to be operated at altitudes up to 1000 meters above sea level and in a temperature range from -20 °C to +40 °C. Any deviation from the normal condition of motor operation must be stated on the motor nameplate. Some components must be changed if the ambient temperature is different from the specified one. Please contact WEG to check the required special features.

For operating temperatures and altitudes differing from those above, the factors indicated in Table 7.2 must be applied to the nominal motor power rating in order to determine the derated available output (Pmax = Pnom x correction factor).

Table 7.2 - *Correction factors for altitude and ambient temperature*

T (°C)	Altitude (m)								
	1000	1500	2000	2500	3000	3500	4000	4500	5000
10							0.97	0.92	0.88
15						0.98	0.94	0.90	0.86
20					1.00	0.95	0.91	0.87	0.83
25				1.00	0.95	0.93	0.89	0.85	0.81
30			1.00	0.96	0.92	0.90	0.86	0.82	0.78
35		1.00	0.95	0.93	0.90	0.88	0.84	0.80	0.75
40	1.00	0.97	0.94	0.90	0.86	0.82	0.80	0.76	0.71
45	0.95	0.92	0.90	0.88	0.85	0.81	0.78	0.74	0.69
50	0.92	0.90	0.87	0.85	0.82	0.80	0.77	0.72	0.67
55	0.88	0.85	0.83	0.81	0.78	0.76	0.73	0.70	0.65
60	0.83	0.82	0.80	0.77	0.75	0.73	0.70	0.67	0.62
65	0.79	0.76	0.74	0.72	0.70	0.68	0.66	0.62	0.58
70	0.74	0.71	0.69	0.67	0.66	0.64	0.62	0.58	0.53
75	0.70	0.68	0.66	0.64	0.62	0.60	0.58	0.53	0.49
80	0.65	0.64	0.62	0.60	0.58	0.56	0.55	0.48	0.44

Motors installed inside enclosures (cubicles) must be ensured an air renewal rate in the order of one cubic meter per second for each 100 kW installed power or fraction of installed power. Totally Enclosed Air Over motors - TEAO (fan and exhaust / smoke extraction) are supplied without cooling fan and the manufacturer of the driven machine is responsible for sufficient motor cooling. If no minimum required air speed between motor fins is indicated on the motor nameplate, ensure the air speed indicated in the table 7.3 is provided. The values shown in Table 7.3 are valid for 60 Hz motors. To obtain the minimum air speed for 50 Hz motors, multiply the values in the table by 0.83.

Table 7.3 *- Minimum required air speed between motor fins (metres/second)*

Frame		Poles			
IEC	**NEMA**	**2**	**4**	**6**	**8**
63 to 90	143/5	14	7	5	4
100 to 132	182/4 to 213/5	18	10	8	6
160 to 200	254/6 to 324/6	20	20	12	7
225 to 280	364/5 to 444/5	22	22	18	12
315 to 355	445/7 to 588/9	25	25	20	15

The voltage and frequency variations may affect the performance characteristics and the electromagnetic compatibility of the motor. The power supply variations should not exceed the values specified in the applicable standards. Examples:

- ABNT NBR 17094 - Parts 1 and 2. The motor has been designed to supply the rated torque for a combined variation in voltage and frequency:
  - Zone A: ±5% of the rated voltage and ±2% of the rated frequency;
  - Zone B: ±10% of the rated voltage and +3% -5% of the rated frequency.

When operated continuously in Zone A or B, the motor may show performance variations and the operating temperature may increase considerably. These performance variations will be higher in Zone B. Thus it is not recommended to operate the motor in Zone B during extended periods.

- IEC 60034-1. The motor has been designed to supply the rated torque for combined variation in voltage and frequency:
  - Zone A: ±5% of the rated voltage and ±2% of the rated frequency;
  - Zone B: ±10% of the rated voltage and +3% -5% of the rated frequency.

When operated continuously in Zone A or B, the motor may show performance variations and the operating temperature may increase considerably. These performance variations will be higher in Zone B. Thus it is not recommended to operate the motor in Zone B during extended periods. For multivoltage motors (example 380-415/660 V), a ±5% voltage variation from the rated voltage is allowed.

- NEMA MG 1 Part 12. The motor has been designed to be operated in one of the following variations:
  - ±10% of the rated voltage, with rated frequency;
  - ±5% of the rated frequency, with rated voltage;
  - A combined variation in voltage and frequency of ±10%, provided the frequency variation does not exceed ±5%.

If the motor is cooled by ambient air, clean the air inlet and outlet openings and cooling fins at regular intervals to ensure a free airflow over the frame surface. The hot air should never be returned to the motor. The cooling air must be at room temperature limited to the temperature range indicated on the motor nameplate (if no room temperature is specified, please consider a temperature range between -20 °C and +40 °C).

Table 7.4 shows the minimum required water flow for water cooled motors considering the different frame sizes and the maximum allowed temperature rise of the cooling water after circulating through the motor. The inlet water temperature should not exceed 40 °C.

Table 7.4 *- Minimum required water flow and the maximum allowed temperature rise of the cooling water after circulating through the motor*

Frame size		Flow rate (litres/minute)	Maximum allowed water temperature rise (°C)
IEC	NEMA		
180	284/6	12	5
200	324/6	12	5
225	364/5	12	5
250	404/5	12	5
280	444/5 445/7 447/9	15	6
315	504/5	16	6
355	586/7 588/9	25	6

Motors fitted with oil mist lubrication systems can be operated continuously for a maximum of one hour after the failure of the oil pumping system.

Considering the sun's heat increases the operating temperature, externally mounted motors should always be protected from direct sunlight exposure.

Each and every deviation from the normal operating condition (tripping of the thermal protection, noise and vibration level increase, temperature and current rise) should be investigated and corrected by WEG Authorized Service Centers.

Motors fitted with cylindrical roller bearings require a minimum radial load to ensure a normal operation. For information regarding the radial preload, please contact WEG.

7.2.1.Limits of vibration

The vibration severity is the maximum vibration value measured at all positions and in all directions as recommended in the standard IEC 60034-14. Table 7.5 specifies the limits of the maximum vibrations magnitudes according to standard IEC 60034-14 for shaft heights IEC 56 to 400, for vibrations grades A and B. The vibration severity limits in Table 7.5 are given as RMS values (Root Mean Square values or effective values) of the vibration speed in mm/s measured in free suspension condition.

Table 7.5 *- Recommended limits for the vibration severity according to standard IEC 60034-14*

Shaft height [mm]	56 ≤ H ≤ 132	132 ≤ H ≤ 280	H > 280
Vibration grade	Vibration severity on elastic base [mm/s RMS]		
A	1.6	2.2	2.8
B	0.7	1.1	1.8

Notes:

1 - The values in Table 7.5 are valid for measurements carried out with decoupled machines (without load) operated at rated voltage and frequency.

2 - The values in Table 7.5 are valid regardless of the direction of rotation of the machine.

3 - The values in Table 7.5 are not applicable to single-phase motors, three-phase motors powered by a single-phase system or to machines mounted in situ or coupled with inertia flywheels or to loads.

According to NEMA MG 1, the allowed vibration limit for standard motors is 0.15 in/s (peak vibration in in/s).

Note:

For the load operation condition, the use of the standard ISO 10816-3 is recommended for evaluating the motor vibration limits. In the load condition the motor vibration will be influenced by several factors, such as, type of the coupled load, condition of the motor fixation, alignment condition under load, structure or base vibration due to other equipments, etc..

8. MAINTENANCE

The purpose of the maintenance is to extend the useful life of the equipment. The non-compliance with one of these previous items can cause unexpected machine failures.

If motors with cylindrical roller or angular contact bearings are to be transported during the maintenance procedures, the shaft locking device must always be fitted. All HGF motors, regardless of the bearing type, must always be transported with the shaft locking device fitted.

All repairs, disassembly and assembly related services must be carried out only by qualified and well-trained personnel by using proper tools and techniques. Make sure that the machine has stopped and it is disconnected from the power supply, including the accessory devices (space heater, brake, etc.), before any servicing is undertaken.
The company does not assume any responsibility or liability for repair services or maintenance operations executed by non-authorized Service Centers or by non qualified service personnel. The company shall have no obligation or liability whatsoever to the buyer for any indirect, special, consequential or incidental loss or damage caused or arising from the company's proven negligence

8.1. GENERAL INSPECTION

The inspection intervals depend on the motor type, application and installation conditions. Proceed as follows during inspection:

- Visually inspect the motor and coupling. Check if abnormal noises, vibrations, excessive heating, wear signs, misalignment or damaged parts are noticed. Replace the damaged parts as required;
- Measure the insulation resistance according to the item 5.4;
- Clean the motor enclosure. Remove oil spills and dust accumulation from the motor frame surface to ensure a better heat transfer to the surrounding ambient;
- Check cooling fan condition and clean the air inlet & outlet openings to ensure a free air flow over the motor;
- Investigate the actual condition of the seals and replace them, if required;
- Drain the condensed water from inside the motor. After draining, reinstall the drain plugs to ensure the degree of protection as indicated on the motor nameplate. The motor must always be positioned so the drain hole is at the lowest position (see item 6);
- Check the connections of the power supply cables, ensuring the correct clearance distance between live and grounded parts, as specified in Table 6.3;
- Check if the tightening torque of the bolted connections and mounting bolts meets the tightening torque specified in Table 8.7;
- Check the status of the cable passages, the cable gland seals and the seals inside the terminal box and replace them, if required;
- Check the bearing operating conditions. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions, like motor temperature rise. Check the oil level, the lube oil condition and compare the workings hours with the informed life time;
- Record and file all changes performed on the motor.

Do not reuse damaged or worn parts. Damaged or worn parts must be replaced by parts supplied by the manufacturer and must be installed as if they were the original parts.

8.2. LUBRICATION

Proper lubrication plays a vital role in the motor performance. Only use the grease or oil types, amounts and lubrication intervals recommended for the bearings. This information is available on the motor nameplate and the lubrication procedures must be carried out according to the type of lubricant (oil or grease).
When the motor is fitted with thermal protection devices for bearing temperature control, consider the operating temperature limits shown in Table 6.4.
The maximum operating temperature of motors used in special applications may differ from those shown in Table 6.4. The grease and oil disposal should be made in compliance with applicable laws in each country.

Please contact WEG when motors are to be installed in special environments or used for special applications.

8.2.1. Grease lubricated rolling bearings

Excess grease causes bearing overheating, resulting in bearing failure.

The lubrication intervals specified in Table 8.1, Table 8.2, Table 8.3 and Table 8.4 consider an absolute temperature on the bearing of 70 °C (up to frame size IEC 200 / NEMA 324/6) and 85 °C (for frame size IEC 225 / NEMA 364/5 and above), the motor running at rated speed, a motor mounted in horizontal position and greased with Mobil Polyrex EM grease. Any variation of the parameters listed above must be evaluated.

Table 8.1 *- Lubrication intervals for ball bearings*

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)					
					ODP (Open Drip Proof)		W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)	
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
90	143/5	2	6205	4	-	-	20000	20000	25000	25000
		4								
		6								
		8								
100	-	2	6206	5	-	-	20000	20000	25000	25000
		4								
		6								
		8								
112	182/4	2	6207/ 6307	9	-	-	20000	20000	25000	25000
		4								
		6								
		8								
132	213/5	2	6308	11	-	-	20000	18400	25000	23200
		4					20000	20000	25000	25000
		6								
		8								
160	254/6	2	6309	13	20000	20000	18100	15700	22000	20000
		4					20000	20000	25000	25000
		6								
		8								
180	284/6	2	6311	18	20000	20000	13700	11500	17000	14000
		4					20000	20000	25000	25000
		6								
		8								
200	324/6	2	6312	21	20000	20000	11900	9800	15000	12000
		4					20000	20000	25000	25000
		6								
		8								
225 250 280 315 355	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 5010/11 586/7 588/9	2	6314	27	18000	14400	4500	3600	5000	4000
		4			20000	20000	11600	9700	14000	12000
		6					16400	14200	20000	17000
		8					19700	17300	24000	20000
		2	6316	34	14000	*Upon request	3500	*Upon request	4000	*Upon request
		4			20000	20000	10400	8500	13000	10000
		6					14900	12800	18000	16000
		8					18700	15900	20000	20000
		2	6319	45	9600	*Upon request	2400	*Upon request	3000	*Upon request
		4			20000	20000	9000	7000	11000	8000
		6					13000	11000	16000	13000
		8					17400	14000	20000	17000
		4	6322	60	20000	20000	7200	5100	9000	6000
		6					10800	9200	13000	11000
		8					15100	11800	19000	14000

Table 8.2 - *Lubrication intervals for cylindrical roller bearings*

Frame		Poles	Bearing designation	Amount of grease (g)	LUBRICATION INTERVALS (hours)					
					ODP (Open Drip Proof)		W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)	
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
160	254/6	2	NU309	13	20000	19600	13300	9800	16000	12000
		4				20000	20000	20000	25000	25000
		6								
		8								
180	284/6	2	NU311	18	18400	12800	9200	6400	11000	8000
		4			20000	20000	20000	19100	25000	25000
		6						20000		
		8								
200	324/6	2	NU312	21	15200	10200	7600	5100	9000	6000
		4			20000	20000	20000	17200	25000	21000
		6						20000		25000
		8								
225 250 280 315 355	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 5010/11 586/7 588/9	4	NU314	27	17800	14200	8900	7100	11000	9000
		6			20000	20000	13100	11000	16000	13000
		8					16900	15100	20000	19000
		4	NU316	34	15200	12000	7600	6000	9000	7000
		6			20000	19000	11600	9500	14000	12000
		8				20000	15500	13800	19000	17000
		4	NU319	45	12000	9400	6000	4700	7000	5000
		6			19600	15200	9800	7600	12000	9000
		8			20000	20000	13700	12200	17000	15000
		4	NU322	60	8800	6600	4400	3300	5000	4000
		6			15600	11800	7800	5900	9000	7000
		8			20000	20000	11500	10700	14000	13000

Table 8.3 - *Lubrication intervals for ball bearings - HGF line*

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	2	6314	27	3100	2100
		4 - 8	6320	50	4500	4500
			6316	34	4500	4500
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T	2	6314	27	3100	2100
		4 - 8	6322	60	4500	4500
			6319	45	4500	4500
400L/A/B and 400 C/D/E	6806/7/8T and 6809/10/11T	2	6315	30	2700	1800
		4 - 8	6324	72	4500	4500
			6319	45	4500	4500
450	7006/10	2	6220	31	2500	1400
		4	6328	93	4500	3300
			6322	60	4500	4500
		6 - 8	6328	93	4500	4500
			6322	60	4500	4500
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 - 8	6330	104	4500	4500
			6324	72	4500	4500
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 - 8	6330	104	4500	4500
			6324	72	4500	4500
560	8806/10	4 - 8	*Upon request			
630	9606/10	4 - 8				

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Table 8.4 - Lubrication intervals for cylindrical roller bearings - HGF line

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8 and 5009/10/11	4	NU320	50	4300	2900
		6 - 8			4500	4500
355L/A/B and 355C/D/E	5807/8/9 and 5810/11/12	4	NU322	60	3500	2200
		6 - 8			4500	4500
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11	4	NU324	72	2900	1800
		6 - 8			4500	4500
450	7006/10	4	NU328	93	2000	1400
		6			4500	3200
		8			4500	4500
500	8006/10	4	NU330	104	1700	1000
		6			4100	2900
		8			4500	4500
560	8806/10	4	NU228 + 6228	75	2600	1600
		6 - 8		106	4500	4500
630	9606/10	4	NU232 + 6232	92	1800	1000
		6		120	4300	3100
		8		140	4500	4500

For each increment of 15 ºC above the bearing temperature, the relubrication intervals given in the Table must be halved. The relubrication interval of motors designed by the manufacturer for mounting in horizontal position, but installed in vertical position (with WEG authorization), must be halved.
For special applications, such as: high and low temperatures, aggressive environments, driven by frequency inverter (VFD - frequency inverter), etc., please contact WEG about the required amount of grease and the relubrication intervals.

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8.2.1.1. Motor without grease fitting

Motors without grease fittings must be lubricated in accordance with the existing Maintenance Plan. Motor disassembly must be carried out as specified in Item 8.3. If motors are fitted with shielded bearings (for example, ZZ, DDU, 2RS, VV), these bearings must be replaced at the end of the grease service life.

8.2.1.2. Motor with grease fitting

To lubricate the bearings with the motor stopped, proceed as follows:
- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Lift grease inlet protection;
- Remove the grease outlet plug;
- Pump in approximately half of the total grease indicated on the motor nameplate and run the motor for about 1 (one) minute at rated speed;
- Switch-off the motor and pump in the remaining grease;
- Lower again the grease inlet protection and reinstall the grease outlet protection.

To grease the motor while running, proceed as follows:
- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Pump the total grease indicated on the motor nameplate;
- Lower again the grease inlet protection.

For lubrication, use only manual grease gun.

If Motors are provided with a spring device for grease removal, the grease excess must be removed by pulling the rod and cleaning the spring until the spring does not remove more grease.

8.2.1.3. Compatibility of the Mobil Polyrex EM grease with other greases

The Mobil Polyrex EM grease has a polyurea thickener and a mineral oil thus being compatible with greases that contain:
- Lithium based thickener, lithium-based complex thickener, polyurea thickener and refined mineral oil;
- The used grease must have in its formulation corrosion and oxidation inhibitors.

In general terms, greases with the same type of soap are compatible to each other. However, depending on the proportion of the mixture there may be incompatibility. In such a case, it is not recommended to mix different types of greases without contacting the supplier or WEG beforehand.

8.2.2. Oil lubricated bearings

To change the oil of oil lubricated motor proceed as follows:
- Switch-off the motor;
- Remove threaded oil drain plug;
- Open the valve and drain the oil;
- Close the drain vale again;
- Reinstall the threaded oil drain plug;
- Fill-up with the type and amount of oil as specified on the nameplate;
- Check oil level. The oil level is OK when the lubricant can be viewed approximately in the center of the sight glass;
- Reinstall oil inlet plug;
- Check for oil leaks and ensure that all not used threaded plugs are closed with plugs.

The bearing lubricating oil must be replaced as specified on the nameplate or whenever changes in the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and must be kept in the center of the sight glass.
Please contact WEG, when oils with different viscosities should be used.

***Note**:*
The HGF vertical mounted motors with high axial thrust are supplied with grease lubricated DE-bearings and with oil lubricated NDE-bearings. The DE-bearings must be lubricated according to recommendations in item 8.2.1. Table 8.5 specifies the oil type and the amount of oil required for this motor lubrication.

***Table 8.5** - Oil properties for HGF vertical mounted motors with high axial thrust*

Mounting - high axial thrust	Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
	IEC	NEMA						
	315L/A/B e 315C/D/E	5006/7/8T e 5009/10/11T	4 - 8	29320	20	8000	Renolin DTA 40 / SHC 629	ISO VG150 mineral oil with antifoam and antioxidant additives
	355L/A/B e 355C/D/E	5807/8/9T e 5810/11/12T	4 - 8	29320	26			
	400L/A/B e 400C/D/E	6806/7/8T e 6809/10/11T	4 - 8	29320	37			
	450	7006/10	4 - 8	29320	45			

8.2.3. Oil mist lubricated bearings

Check the service conditions of the seals and if replacement is required use only original components. Clean the seal components before assembly (bearing caps, end shields, etc.).
Apply joint sealant between the bearing caps and end shields. The joint sealant must be compatible with the used lubricating oil. Connect the oil lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12.

8.2.4. Sleeve bearings

The lubricating oil of sleeve bearings must be changed at the intervals specified in Table 8.6. To replace the oil, proceed as follows:
- NDE-bearing: remove the protection plate from the fan cover;
- Drain the oil through the drain hole located at the bottom of the bearing (see Figure 8.1);
- Close the oil drain hole;
- Remove the oil inlet plug;
- Fill the sleeve bearing with the specified oil and with the amount of oil specified in;
- Check the oil level and ensure it is kept close to the center of the sight glass;
- Install the oil inlet plug;
- Check for oil leaks.

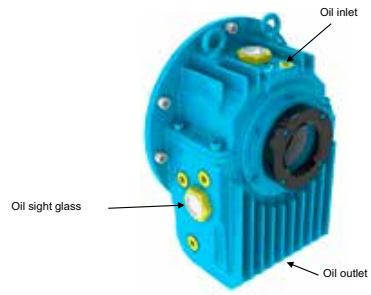


***Figure 8.1** - Sleeve bearing*

Table 8.6 - *Oil properties for sleeve bearings*

Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
IEC	NEMA						
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	2	9-80	2.8	8000	Renolin DTA 10	ISO VG32 mineral oil with antifoam and antioxidant additives
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T						
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11T						
450	7006/10						
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	4 - 8	9-90	2.8	8000	Renolin DTA 15	ISO VG46 mineral oil with antifoam and antioxidant additives
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T		9-100				
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11T		11-110	4.7			
450	7006/10		11-125				
500	8006/10						

The lubricating oil must be replaced as specified on the nameplate or whenever changes on the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and kept in the center of the sight glass.
Please contact WEG, when oils with different viscosities are to be used.

8.3. MOTOR ASSEMBLY AND DISASSEMBLY

All repair services on motors should be always performed by qualified personnel and in accordance with the applicable laws and regulations in each country. Always use proper tools and devices for motor disassembly and assembly.

Disassembly and assembly services can be carried out only after the motor has been disconnected from the power supply and is completely stopped.

Dangerous voltages may be present at the motor terminals inside the terminal box since capacitors can retain electrical charge for long periods of time even when they are not connected directly to a power source or when space heaters are connected to the motor or when the motor windings are used as space heaters. Dangerous voltages may be present at the motor terminals when they are driven by frequency inverter even when they are completely stopped.

Record the installation conditions such as terminal connection diagram, alignment / leveling conditions before starting the disassembly procedures. These records should be considered for later assembly.

Disassemble the motor carefully without causing scratches on machined surfaces or damaging the threads.

Assemble the motor on a flat surface ensuring a good support base. Footless motors must be fixed/locked on the base to prevent accidents.

Handle the motor carefully to not damage the insulated components such as windings, insulated rolling bearings, power cables etc..

Seal elements, such as joint seals and bearing seals should always be replaced when wear or damage is noticed.

Motors with degree of protection higher than IP55 are supplied with joint and screw seal Loctite 5923 (Henkel) Clean the components and apply a new coat of Loctite 5923 on the surfaces before assembly.

8.3.1. Terminal box

Proceed as follows to remove the terminal box cover and to disconnect/connect the power supply cables and the cables of the accessory devices:

- Ensure that during the screw removal the terminal box cover does not damage the components installed inside the terminal box;
- If the terminal box cover is fitted with lifting eyebolt, lift the terminal box cover always by its lift eyebolt;
- If motors are supplied with terminal blocks, ensure the correct tightening torque on the motor terminals as specified in Table 8.7;
- Ensure that the cables do not contact sharp edges;
- Ensure that the original IP degree of protection is not changed and is maintained as indicate on the motor nameplate. The power supply cables and the control cables must always be fitted with components (cable glands, conduits) that meet the applicable standards and regulations of each country;
- Ensure that the pressure relief device is in perfect operating condition, if provided. The seals in the terminal box must be in perfect condition for reuse and must be reinstalled correctly to ensure the specified degree of protection;
- Ensure the correct tightening torque for the securing bolts of the terminal box cover as specified in Table 8.7.

Table 8.7 *- Tightening torque for the securing bolts [Nm]*

Screw type and seal	M4	M5	M6	M8	M10	M12	M16	M20
Hex bolt/hex socket bolt (without seal)	-	4 to 7	7 to 12	16 to 30	30 to 50	55 to 85	120 to 180	230 to 360
Combined slotted screw (without seal)	-	3 to 5	5 to 10	10 to 18	-	-	-	-
Hex bolt/hex socket bolt (with seal with metallic stop/cord)	-	-	-	13 to 20	25 to 37	40 to 55	50 to 65	-
Combined slotted screw (with flat seal 'and/or mettallic stop/cord)	-	3 to 5	4 to 8	8 to 15	-	-	-	-
Hex bolt/hex socket bolt (with flat seal)	-	-	-	8 to 15	18 to 30	25 to 40	35 to 50	-
Terminal blocks	1 to 1,5	1,5 to 4	3 to 6,5	6 to 9	10 to 18	15,5 to 30	30 to 50	-
Grounding terminals	-	3 to 5	5 to 10	10 to 18	30 to 50	55 to 85	120 to 180	-

8.4. DRYING THE STATOR WINDING INSULATION

Dismantle the motor completely. Remove the end shields, the rotor with the shaft, the fan cover, the fan and the terminal box before the wound stator with the frame is transferred to the oven for the drying process. Place the wound stator in the oven heated to max. 120 °C for two hours. For larger motors a longer drying time may be required. After the drying process has been concluded, allow the stator to cool to room temperature. Measure the insulation resistance again as described in item 5.4. Repeat the stator drying process if the required insulation resistance does not meet the values specified in Table 5.3. If the insulation resistance does not improve despite several drying processes, evaluate the causes of the insulation resistance drop carefully and an eventual replacement of the motor winding may be required. If in doubt contact WEG.

To prevent electrical shock, discharge the motor terminals immediately before, and after each measurement. If the motor is equipped with capacitors, these must be discharged before beginning any repair.

8.5. SPARE PARTS

When ordering spare parts, always provide complete motor designation, indicating the motor type, the code number and the serial number, which are stated on the motor nameplate.

Spare parts must always be purchased from WEG authorized Service Centers. The use of non-original spare parts can cause motor failure, performance drop and void the product warranty.

The spare parts must be stored in a clean, dry and properly ventilated room, with relative air humidity not exceeding 60%, with ambient temperature between 5 °C and 40 °C, free of dust, vibrations, gases, corrosive smokes and at constant temperature. The spare parts must be stored in their normal mounting position without placing other components onto them.

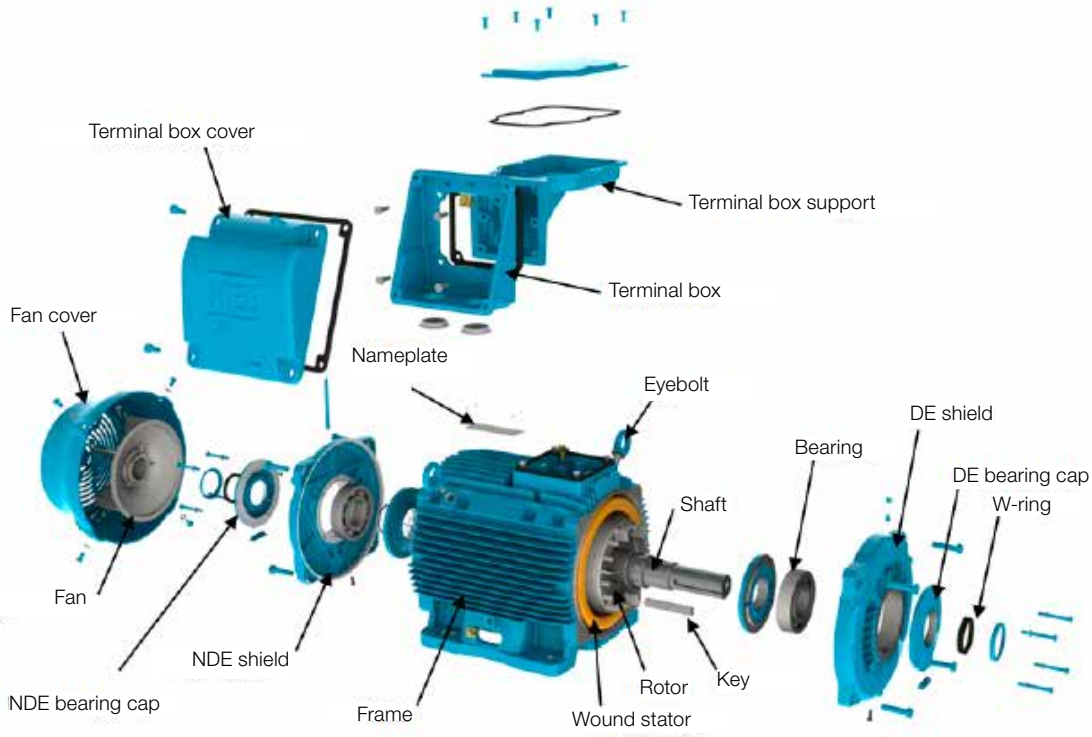


Figure 8.2 *- Exploded view of the components of a W22 motor*

9. ENVIRONMENTAL INFORMATION

9.1. PACKAGING

WEG electric motors are supplied in cardboard, plastic or wooden packaging. These materials can be recycled and must be disposed according to the applicable laws and regulations in each country. All wood used in the packaging of WEG motors come from the company reforestation program and is not submitted to any chemical conservation treatment.

9.2. PRODUCT

Electric motors consist mainly of ferrous metals (steel plates and cast iron), non ferrous metals (copper and aluminum) and plastic materials.

In general, electric motors have relatively long service live. However when they must be discarded, WEG recommends to dismantle the motor, sort the different materials and send them for recycling.

No-recyclable materials should be disposed of at industrial landfills according to the applicable environmental laws and regulations in each country, or co-processed in cement kilns or incinerated.

The recycling service providers, the disposal in industrial landfills, the waste co-processing or the incineration process must be properly authorized by the state environment agency to carry out these activities.

10. TROUBLESHOOTING CHART X SOLUTIONS

This troubleshooting chart provides a basic list of problems that may occur during motor operation, possible causes and recommended corrective actions. In case of doubts, please contact WEG Service Center.

Problem	Possible cause	Corrective action
Motor does not start, neither coupled nor decoupled	Power cables are interrupted	Check the control panel and the motor power supply cables
	Blown fuses	Replace blown fuses
	Wrong motor connection	Correct the motor connection according to connection diagram
	Locked rotor	Check motor shaft to ensure that it rotates freely
The motor starts at no-load, but fails when load is applied. It starts very slowly and does not reach the rated speed	Load toque is too high during start-up	Do not start the motor on load
	Too high voltage drop in the power cables	Check the installation dimensioning (transformer, cable cross section, relays, circuit breakers, etc.)
Abnormal/excessive noise	Defective transmission component or defective driven machine	Check the transmission force, the coupling and the alignment
	Misaligned / unleveled base	Align / level the motor with the driven machine
	Unbalanced components or unbalanced driven machine	Balance the machine set again
	Different balancing methods used for motor and coupling balancing (halve key, full key)	Balance the motor again
	Wrong motor direction of rotation	Reverse the direction of rotation
	Loose bolts	Retighten the bolts
	Foundation resonance	Check the foundation design
	Damaged bearings	Replace the bearings
Motor overheating	Insufficient cooling	Clean air inlet and outlet and cooling fins
		Check the minimum required distance between the fan cover and nearest walls. See item 7
		Check air temperature at inlet
	Overload	Measure motor current, evaluate motor application and if required, reduce the load
	Number of starts per hour is too high or the load inertia moment is too high	Reduce the number of starts per hour
	Power supply voltage too high	Check the motor power supply voltage. Power supply voltage must not exceed the tolerance specified in item 7.2
	Power supply voltage too low	Check the motor power supply voltage and the voltage drop. Power supply voltage must not exceed the tolerance specified in item 7.2
	Interrupted power supply	Check the connection of the power cables
	Voltage unbalance at the motor terminals	Check for blown fuses, wrong commands, voltage unbalance in the power line, phase fault or interrupted power cables
	Direction of rotation is not compatible with the unidirectional fan	Check if the direction of rotation matches the rotation arrow indicated on end shield
Bearing overheating	Excessive grease/oil	Clean the bearing and lubricate it according to the provided recommendations
	Grease/oil aging	
	The used grease/oil does not matches the specified one	
	Lack of grease/oil	Lubricate the bearing according to the provided recommendations
	Excessive axial or radial forces due to the belt tension	Reduce the belt tension
		Reduce the load applied to the motor

11. WARRANTY TERM

WEG Equipamentos Elétricos S/A, Motors Unit ("WEG"), offers warranty against defects in workmanship and materials for its products for a period of 18 months from the invoice date issued by the factory or distributor/ dealer, limited to 24 months from the date of manufacture.
Motors of the HGF Line are covered for a period of 12 months from the invoice date issued by the factory or distributor / dealer, limited to 18 months from the date of manufacture.
The paragraphs above contain the legal warranty periods.
If a warranty period is defined in a different way in the commercial/technical proposal of a particular sale, that will supersede the time limits set out above.
The warranty periods above are independent of the product installation date and the startup.
If any defect or abnormal occurrence is detected during machine operation, the customer must immediately notify WEG in writing about the occurred defect, and make the product available for WEG or its Authorized Service Center for the period required to identify the cause of the defect, check the warranty coverage, and perform the proper repairs.
In order for the warranty to be valid, the customer must be sure to follow the requirements of WEG's technical documents, especially those set out in the product Installation, Operation and Maintenance Manual, as well as the applicable standards and regulations in force in each country.
Defects arising from the inappropriate or negligent use, operation, and/or installation of the equipment, non-execution of regular preventive maintenance, as well as defects resulting from external factors or equipment and components not supplied by WEG, will not be covered by the warranty.
The warranty will not apply if the customer at its own discretion makes repairs and/or modifications to the equipment without prior written consent from WEG.
The warranty will not cover equipment, components, parts and materials whose lifetime is usually shorter than the warranty period. It will not cover defects and/or problems resulting from force majeure or other causes not imputable to WEG, such as, but not limited to: incorrect or incomplete specifications or data supplied by the customer; transportation, storage, handling, installation, operation and maintenance not complying with the provided instructions; accidents; defects in the construction works; use in applications and/or environments for which the machine was not designed; equipment and/or components not included in the scope of WEG supply. The warranty does not include disassembly services at the buyer's premises, product transportation costs and travel, lodging and meal expenses for the technical staff of the Service Centers, when requested by the customer.
The services under warranty will be provided exclusively at WEG authorized Service Centers or at one of its manufacturing plants. Under no circumstances will the warranty services extend the equipment warranty period.
WEG's Civil Liability is limited to the supplied product; WEG will not be liable for indirect or consequential damages, such as losses of profit and revenue losses and alike which may arise from the contract signed between the parties.

12. EC DECLARATION OF CONFORMITY

WEG Equipamentos Elétricos S/A
Av. Prefeito Waldemar Grubba, 3000
89256-900 - Jaraguá do Sul – SC – Brazil,

and its authorised representative established in the European Community,
WEGeuro – Industria Electrica SA
Contact person: Luís Filipe Oliveira Silva Castro Araújo
Rua Eng Frederico Ulrich, Apartado 6074
4476-908 – Maia – Porto – Portugal

hereby declare that the products:

WEG induction motors and components for using in these motors:

Three-phase
IEC frames 63 to 630
Nema frames 42, 48, 56 and 143 to 9610
……
Single-phase
IEC frames 63 to 132
Nema frames 42, 48, 56 and 143 to 215
……

when installed, maintained and used in applications for which they were designed, and in compliance with the relevant installation standards and manufacturer's instructions, comply with the requirements of the following European Directives and standards where applicable:

Directives:
Low Voltage Directive 2006/95/EC*
Regulation (EC) No 640/2009*
Directive 2009/125/EC*
Machinery Directive 2006/42/EC**
EMC Directive 2004/108/EC (inductions motors are considered inherently benign in terms of electromagnetic compatibility)

Standards:
EN 60034-1:2010/ EN 60034-2-1:2007/EN 60034-5:2001/A1:2007/ EN 60034-6:1993/ EN 60034-7:1993/A1:2001/ EN 60034-8:2007/ EN 60034-9:2005/A1:2007/ EN 60034-11:2004/ EN 60034-12:2002/A1:2007/ EN 60034-14:2004/A1:2007/ EN 60034-30:2009, EN 60204-1:2006/AC:2010 and EN 60204-11:2000/AC:2010

CE marking in: **1996**
* Electric motors designed for use with a voltage rating higher than 1,000 V are not considered under the scope.
** Low voltage electric motors are not considered under the scope and electric motors designed for use with a voltage rating higher than 1,000 V are considered partly completed machinery and are supplied with a

Declaration of Incorporation:

The products above cannot be put into service until the machinery into which they have been incorporated has been declared in conformity with the Machinery Directive.

A Technical Documentation for the products above is compiled in accordance with part B of annex VII of Machinery Directive 2006/42/EC.

We undertake to transmit, in response to a reasoned request by the national authorities, relevant information on the partly completed machinery identified above through WEG authorised representative established in the European Community. The method of transmission shall be electronic or physical method and shall be without prejudice to the intellectual property rights of the manufacturer.

Milton Oscar Castella
Engineering Director

Jaraguá do Sul, April 8th, 2013

WEG Worldwide Operations

ARGENTINA
WEG EQUIPAMIENTOS ELECTRICOS
San Francisco - Cordoba
Phone: +54 3564 421 484
info-ar@weg.net
www.weg.net/ar

WEG PINTURAS - Pulverlux
Buenos Aires
Phone: +54 11 4299 8000
tintas@weg.net

AUSTRALIA
WEG AUSTRALIA
Victoria
Phone: +61 3 9765 4600
info-au@weg.net
www.weg.net/au

AUSTRIA
WATT DRIVE - WEG Group
Markt Piesting - Vienna
Phone: +43 2633 404 0
watt@wattdrive.com
www.wattdrive.com

BELGIUM
WEG BENELUX
Nivelles - Belgium
Phone: +32 67 88 84 20
info-be@weg.net
www.weg.net/be

BRAZIL
WEG EQUIPAMENTOS ELÉTRICOS
Jaraguá do Sul - Santa Catarina
Phone: +55 47 3276-4002
info-br@weg.net
www.weg.net/br

CHILE
WEG CHILE
Santiago
Phone: +56 2 784 8900
info-cl@weg.net
www.weg.net/cl

CHINA
WEG NANTONG
Nantong - Jiangsu
Phone: +86 0513 8598 9333
info-cn@weg.net
www.weg.net/cn

COLOMBIA
WEG COLOMBIA
Bogotá
Phone: +57 1 416 0166
info-co@weg.net
www.weg.net/co

FRANCE
WEG FRANCE
Saint Quentin Fallavier - Lyon
Phone: +33 4 74 99 11 35
info-fr@weg.net
www.weg.net/fr

GERMANY
WEG GERMANY
Kerpen - North Rhine Westphalia
Phone: +49 2237 9291 0
info-de@weg.net
www.weg.net/de

GHANA
ZEST ELECTRIC GHANA
WEG Group
Accra
Phone: +233 30 27 664 90
info@zestghana.com.gh
www.zestghana.com.gh

INDIA
WEG ELECTRIC INDIA
Bangalore - Karnataka
Phone: +91 80 4128 2007
info-in@weg.net
www.weg.net/in

WEG INDUSTRIES INDIA
Hosur - Tamil Nadu
Phone: +91 4344 301 501
info-in@weg.net
www.weg.net/in

ITALY
WEG ITALIA
Cinisello Balsamo - Milano
Phone: +39 02 6129 3535
info-it@weg.net
www.weg.net/it

JAPAN
WEG ELECTRIC MOTORS JAPAN
Yokohama City - Kanagawa
Phone: +81 45 550 3030
info-jp@weg.net
www.weg.net/jp

MALAYSIA
WATT EURO-DRIVE - WEG Group
Shah Alam, Selangor
Phone: 603 78591626
info@wattdrive.com.my
www.wattdrive.com

MEXICO
WEG MEXICO
Huehuetoca
Phone: +52 55 5321 4231
info-mx@weg.net
www.weg.net/mx

VOLTRAN - WEG Group
Tizayuca - Hidalgo
Phone: +52 77 5350 9354
www.voltran.com.mx

NETHERLANDS
WEG NETHERLANDS
Oldenzaal - Overijssel
Phone: +31 541 571 080
info-nl@weg.net
www.weg.net/nl

PERU
WEG PERU
Lima
Phone: +51 1 472 3204
info-pe@weg.net
www.weg.net/pe

PORTUGAL
WEG EURO
Maia - Porto
Phone: +351 22 9477705
info-pt@weg.net
www.weg.net/pt

RUSSIA and CIS
WEG ELECTRIC CIS
Saint Petersburg
Phone: +7 812 363 2172
info-ru@weg.net
www.weg.net/ru

SOUTH AFRICA
ZEST ELECTRIC MOTORS
WEG Group
Johannesburg
Phone: +27 11 723 6000
info@zest.co.za
www.zest.co.za

SPAIN
WEG IBERIA
Madrid
Phone: +34 91 655 30 08
info-es@weg.net
www.weg.net/es

SINGAPORE
WEG SINGAPORE
Singapore
Phone: +65 68589081
info-sg@weg.net
www.weg.net/sg

SCANDINAVIA
WEG SCANDINAVIA
Kungsbacka - Sweden
Phone: +46 300 73 400
info-se@weg.net
www.weg.net/se

UK
WEG ELECTRIC MOTORS U.K.
Redditch - Worcestershire
Phone: +44 1527 513 800
info-uk@weg.net
www.weg.net/uk

UNITED ARAB EMIRATES
WEG MIDDLE EAST
Dubai
Phone: +971 4 813 0800
info-ae@weg.net
www.weg.net/ae

USA
WEG ELECTRIC
Duluth - Georgia
Phone: +1 678 249 2000
info-us@weg.net
www.weg.net/us

ELECTRIC MACHINERY
WEG Group
Minneapolis - Minnesota
Phone: +1 612 378 8000
www.electricmachinery.com

VENEZUELA
WEG INDUSTRIAS VENEZUELA
Valencia - Carabobo
Phone: +58 241 821 0582
info-ve@weg.net
www.weg.net/ve

For those countries where there is not a WEG own operation, find our local distributor at www.weg.net.

WEG Group - Motors Business Unit
Jaraguá do Sul - SC - Brazil
Phone: +55 47 3276 4000
motores@weg.net
www.weg.net

Cod: 50033244 | Rev: 10 | Date (m/y): 02/2014

MANUFACTURER'S SERVICES

Customer Focused Aftermarket Solutions

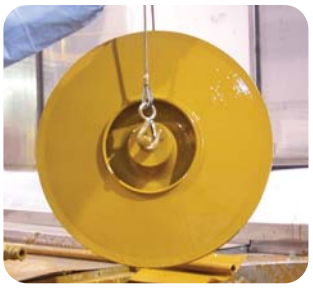
MULTISTAGE CENTRIFUGAL BLOWERS

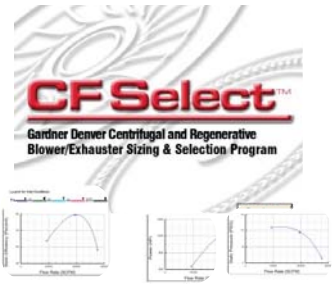
HOFFMAN

LAMSON

Aftermarket Product Menu

SUPERIOR SERVICE AND
GENUINE HOFFMAN & LAMSON PARTS





Field Services

- Warranty Renewal Programs
- Predictive Maintenance Programs
- Start-up
- Certified Vibration Analysis
- Laser Alignment
- Troubleshooting
- Training
- Diagnostics
- Testing

Products

- Genuine Factory Parts
  - New Blower
  - Components
  - Factory Certified
  - Reconditioned Components
  - Control Components
- Factory Reconditioned Blowers
- Blower Lubricants
- Blower Accessories
- Blower Controls
- Buy-backs

Factory Services

- Worldwide Blower Repair
- Rotor Re-balance
- Machine Component Forensic Inspection
- Testing
  - ASME
  - Gas
  - Mechanical
  - Hydrostatic
  - Overspeed
  - Dye Penetrant
- In-House Blast Cleaning and Specialty Coatings

Engineering Services

- Blower Reconfiguration for Performance Changes
- Performance Curves
- Amp Curves
- System Consulting
- Technical Product Support
- Custom Application Engineering
- Seismic Calculations
- Product Upgrades
- Instrumentation Upgrades

HOFFMAN LAMSON

One-Year Factory Warranty

TO PROTECT YOUR INVESTMENT

All Hoffman® and Lamson® Factory Service products and services are backed by our One-Year Factory Warranty. Since our inception over 100 years ago, Hoffman & Lamson have provided quality industrial products backed by superior service and aftermarket support. Today, the tradition continues, as Hoffman & Lamson products are supported by an international team of engineers and service professionals who know how to keep your blowers running at maximum efficiency. Our factory-trained service technicians are available for on-site/on-demand repair service, training, troubleshooting and consulting. We service Hoffman & Lamson blowers, as well as most other brands of centrifugal blowers.

For added assurance, we offer our exclusive Hoffman & Lamson Warranty Renewal Program. Along with our superior service comes superior parts. "Unauthorized" repair shops have been known to use reconditioned parts for blower repairs, resulting in a short repair life. Improper and non-factory approved lubricants may also be incorrectly specified by unauthorized repair shops or individuals. We use only genuine Hoffman & Lamson factory-certified replacement parts and superior lubricants specifically formulated for optimal blower performance.

Protect your investment with confidence. Go with the Hoffman & Lamson team of service and customer service professionals for all of your after-the-sale service and aftermarket needs.

Products

ORIGINAL EQUIPMENT QUALITY

Remanufactured Blowers/Exhausters

Hoffman & Lamson offer a wide range of factory remanufactured blowers and exhausters available for immediate shipment. Remanufactured blowers are built to the same exacting standards as our new machines, rigorously tested and carry the same factory warranty. If we do not have a particular remanufactured blower in stock, we can build one to match your specific application. Remanufactured blowers and exhausters offer an excellent, cost-effective alternative to new machines, and they are ideal for short-term projects, spares and even permanent installations.

Why Choose Remanufactured?

- Cost effective
- Same warranty as new
- All Genuine Factory Certified Parts
- Ideal for short-term projects
- Emergency Solutions
- Same specifications as new, incorporating latest design upgrades

Remanufactured Models Available	
Hoffman® Series	**Lamson® Series**
42	310
741/384	510/550
751	810/850
383	1210/1250
761	1260
791	1400
671	1850/1870

Buy-Back Program

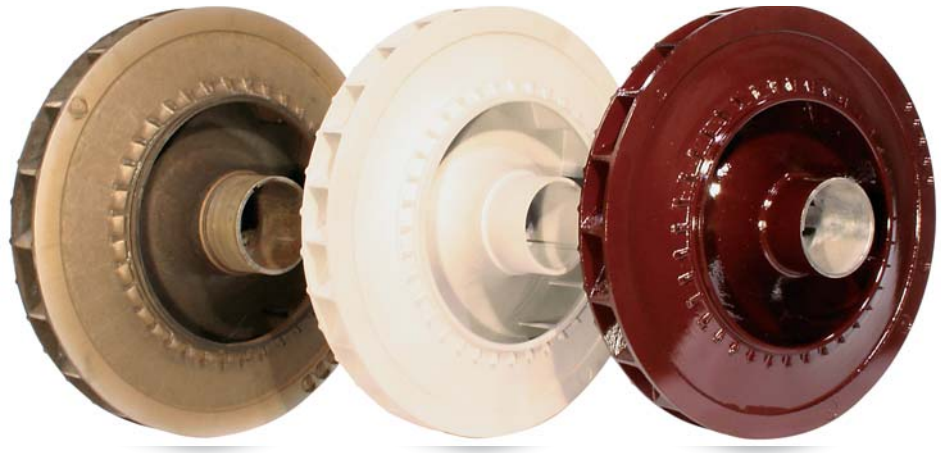
Do you have old blowers that have been abandoned or are not being used? We will buy back many popular models and pick them up at your location. Contact the Hoffman/Lamson service group or your local representative.

Genuine Hoffman & Lamson Parts and Lubricants

Keep your Hoffman & Lamson investment running smoothly for years with Genuine Hoffman & Lamson parts and lubricants from your local Authorized Hoffman & Lamson Sales and Service Representative. These professionals provide you the expert guidance you appreciate for sales assistance, installation support and maintenance advice. Whether you're replacing a typical wear component or changing the grease or oil, nothing outperforms genuine Hoffman & Lamson factory parts and lubricants. They're specifically engineered for superior performance and extended life of your blower/exhauster.

Factory Services

LOCATIONS WORLDWIDE



In-House Sandblasting and Heresite Coatings and Heresite Coatings.

Rotor Balancing

ASME PTC-10 Testing

Hoffman & Lamson Factory Repairs

Hoffman & Lamson offer complete repair capability worldwide. Factory repair specialists completely disassemble, clean, inspect, re-balance and repair your blower to its original factory specifications. All repairs are done using genuine factory certified parts. When repairs are complete, each machine is rigorously tested to factory standards and covered by a new product warranty.

Hoffman & Lamson Factory Field Service

Regionally located Factory Service Technicians can be dispatched to your facility for on-site repairs, troubleshooting and other factory services, such as laser alignment, vibration analysis, operator and maintenance training and warranty renewal services.

Field Services

Preventive Maintenance Agreement/Warranty Renewal Program

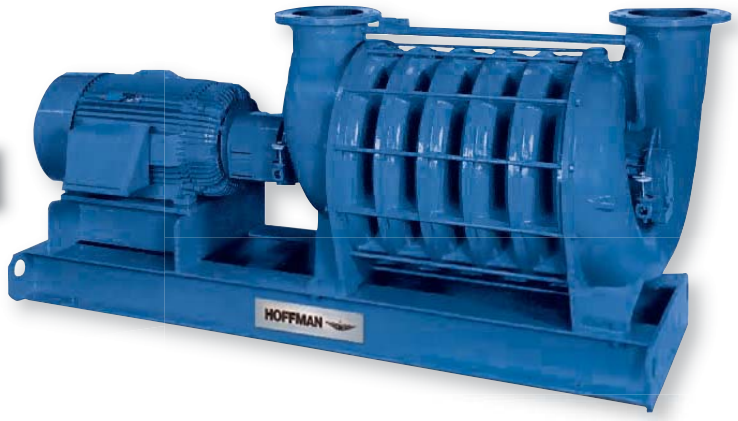
- Exclusive to Hoffman & Lamson
- Comprehensive set of service and maintenance procedures
- Designed to return your blower to a rewarrantable condition
- Provides increased reliability and performance

Work Scope

- On-site inspection
- Work performed on-site with factory-trained technicians
- Complete inspection and repair report provided
- Worn or defective parts replaced or repaired with genuine factory certified parts
- New equipment warranty is re-initiated

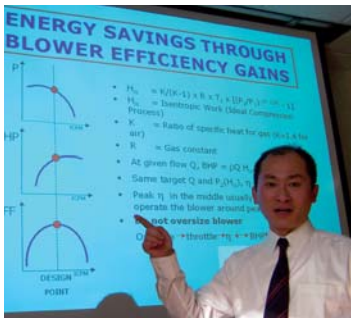
Benefits

- Lower overall repair and reinstallation cost
- Quicker return of unit to service
- On-site equipment and operator training
- Customer is provided with a comprehensive insurance program covering equipment, process operation and operator training



Engineering Services

In addition to the many field services, we offer engineering services performed by an experienced, dedicated staff to provide amp curves, performance curves and seismic calculations. They are also available for general consulting and technical support. In most cases, they can also reconfigure your Hoffman or Lamson blower/exhauster to meet the precise requirements of any application or process changes. Need more airflow, pressure or vacuum? Our application engineers can determine what modifications would be needed, and our specialists will add the necessary stages and impellers to meet your needs. The modified blower will be built to factory specifications with genuine Hoffman or Lamson parts and will receive a one-year warranty like a new blower.



Gardner Denver

www.HoffmanandLamson.com
info.hoffmanlamson@gardnerdenver.com

Gardner Denver Nash PO Box 130 Bentleyville, PA 15314 USA
New Equipment Sales: (800) 543-7736 Aftermarket Parts Sales: (800) 982-3009
Phone: +1 724-239-1500 Fax: +1 724-239-1502

ENERGY STAR PARTNER

BSI

MEMBER OF CAGI Compressed Air & Gas Institute

HOFFMAN LAMSON
by Gardner Denver

Policy

2022 Field Service Rates

Centrifugal Products

Jan 1, 2021 – December 31, 2021

POLICY:
The services of a technician or engineer from Gardner Denver Engineered Products Division to inspect or repair a machine in the field, whether under warranty or not, are subject to a service charge. A firm commitment in the form of a hard copy purchase order will be required before the technician or engineer is scheduled and/or departs for any job site.

A PURCHASE ORDER MUST BE EMAILED, ALONG WITH GARDNER DENVER SITE READINESS COMPLETED PAPERWORK (IF APPLICABLE), TO OUR SERVICE DEPARTMENT AT SERVICE.CF@GARDNERDENVER.COM BEFORE ANY SERVICE CAN BE PERFORMED.

If the machine in question is within the warranty period and inspection by the Gardner Denver technician or engineer reveals a defect in workmanship or materials for which the factory is accountable, the service charge will be rescinded. However, if in the judgment of Gardner Denver, the factory is not accountable for whatever defect or deficiency exists, then the service charge will apply. Gardner Denver terms and conditions of sale apply to all field service work

LEVELS OF SERVICE:

Field Service Technicians provide customers with
- Preventative Maintenance / Warranty Renewal Programs
- Exclusive to Hoffman & Lamson
- Comprehensive set of service and maintenance procedures
- Designed to return your blower to a warrantable condition
- Provides increased reliability and performance
- Start-up
- Laser Alignment
- Troubleshooting
- Diagnostics & Testing

Training, Controls Tuning & Site Analysis provide customers with
- Certified Vibration Analysis
- Training and Maintenance Seminars

Engineering Services provide customers with
- Blower reconfiguration for performance changes
- Performance curves
- Amp curves
- System Consulting
- Technical product support
- Customer application engineering
- Seismic Calculation
- Product Upgrades
- Instrumentation upgrades

Level of service required and associated rates will be verified prior to commencing service work.

NORTH AMERICA SERVICE RATES:

- Field Service Technician: $180.00 USD per hour (6-hour minimum)
- Training, Controls Tuning & Site Analysis: $200.00 USD per hour (6-hour minimum)
- Engineering Services: $220.00 USD per hour (6-hour minimum)
- Transportation
  - By company car $0.80 per mile, rental cars – as incurred.
  - By common carrier – as incurred
- Living Expenses - $305 per diem

INTERNATIONAL SERVICE RATES:

- Field Service Technician: $225.00 USD per hour (6-hour minimum)
- Training, Controls Tuning & Site Analysis: $255.00 USD per hour (6-hour minimum)
- Engineering Services: $290.00 USD per hour (6-hour minimum)
- Transportation
  - By company car $0.80 per mile, rental cars – as incurred.
  - By common carrier – as incurred
- Living Expenses - $305 per diem

OVERTIME & EXPENSES:

Work and/or travel totaling over 8 hours per day Monday through Friday and all Saturday work or travel will be charged at 1.5 times the applicable rate. All chargeable Sundays and holidays will be 2 times the applicable rate. Where work extends from one week to the next, but no work is performed over weekend, customer has option. (1) Paying roundtrip to base point including time and expenses, or (2) retaining Representative in local area, paying living expenses. Rates at 1.5 times daily rates for Saturdays and/or 2 times for Sundays not worked.

EMERGENCY VISITS

Service rates for emergency field service requests (typically 2 weeks or less from request to departure) will incur 20% for labor and travel rates before a technician or engineer departs and will be communicated in advance.

CANCELLATION POLICY

Please note that once a Service Visit has been scheduled, time has been reserved in the schedule exclusively for you. If the visit is cancelled less than 24 hours before it is scheduled to take place, a minimum cancellation fee of $500 or 10% of the total visit (whichever is greater) will be charged.

To avoid a cancellation fee, please provide notice at least 24 hours prior to your appointment.
You can cancel or reschedule an appointment by emailing us at: ***service.cf@gardnerdenver.com***
or calling 1-800-770-NASH

PARTS:
Any parts used for service will be invoiced at prevailing prices unless repair is being covered under warranty. All parts are shipped Ex-works, factory, Charleroi, PA 15022 USA.

INCREASE OF SERVICE RATES:
Rates quoted herein are subject to adjustment without notice. Charges for engineering or technical field service will be based upon rates in effect at the time the services are performed, but in no case will an increase exceed 10% of the quoted rates. *Service Quotes provided are estimates, actual time and expenses will be invoiced.*

STARTUP:
If the Field Service Technician is required to make a second trip because the job is not ready for start-up, or any other items in the checklist are incomplete, a hard copy purchase order to Gardner Denver Inc. will be required before the technician returns to the jobsite. This start-up trip is also contingent on a current account in good standing.

PAYMENT:
Subject to Gardner Denver terms and conditions of sale. Net 30 days subject to Gardner Denver credit manager approval. Orders over $100,000.00 USD may be subject to progress payments. We accept approved credit card orders. No International service work will commence without the customer having opened a letter of credit or cash in advance. The cost of the service will be estimated beforehand and adjusted after the work is completed. There will be no exceptions to this policy.

INTERNATIONAL TRAVEL:
Gardner Denver company policy allows for business class travel for any international flight of eight (8) hours or more in duration.

HOFFMAN LAMSON
by Gardner Denver

Accessories
Lubricant Reorder Form
Centrifugal Products

AEON® Lubricants for Centrifugal Products

To re-order lubricant specifically engineered for your Gardner Denver Centrifugal Products, please call **1-800-982-3009** and/or fax your order to **+1 724-239-1502.**

Protect Your Investment – Insist on Genuine Gardner Denver AEON® Lubricants

Date: _____

P.O. #_____

CUSTOMER INFORMATION

Sold To: _____

Name _____

Company _____

Address _____

_____

City/State/Zip _____

_____

Phone _____

Fax _____

E-mail _____

ORDER INFORMATION

Ship To: _____

Name _____

Company _____

Address _____

_____

City/State/Zip _____

☐ Lamson ☐ Hoffman ☐ Other (specify) _____

Blower Model # _____

Blower Serial # _____

Buy By the Case and Save

LUBRICANT	PART NUMBER	QTY.
AEON® Centrifugal Grease		
5 oz. Tube	301RGA786	
Case – 12 Tubes	304RGA786	
14 oz. Cartridge	302RGA786	
Case – 12 Cartridges	305RGA786	
AEON CF-46 Centrifugal Oil (Standard)		
32 oz. Quart	BC3018120000	
Case – 12 Quarts	BC3018220000	
AEON CF-150 Centrifugal Oil (High Temperature)		
32 oz. Quart	300RGA786	
Case – 12 Quarts	303RGA786	

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
Phone: +1 800-982-3009 / +1 724-239-1500
Fax: +1 724-239-1502
E-mail: info.HoffmanLamson@gardnerdenver.com
Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

Requirements for Start-up on Gardner Denver Centrifugal Blowers

Date: _____

GD Sales Order #: _____

Project Name: _____

Contact Person: _____

Phone: _____ ***Fax:*** _____

e-mail: _____

Prior to Gardner Denver's commitment of a Field Service Technician to perform start-up on subject equipment, Attachment 1 must be completed, signed and returned. Please retain Attachment 2 and Attachment F for the appropriate Representative or Technician to complete.

Pre Startup Equipment Checklist for Contractor/Customer

Note If the Field Service Technician is required to make a second trip because the job is not ready for start-up, or any other items in the checklist are incomplete, a hard copy purchase order to *Gardner Denver Inc.* will be required before the technician returns to the jobsite. This start-up trip is also contingent on a current account in good standing. We appreciate your cooperation in this manner.

_____

Customer Signature

Gardner Denver Engineered Products Division
100 Gardner Park, Peachtree City, GA 30269
Phone: 800-982-3009 / 770-632-5000
Fax: 770-486-5628
E-mail: blowersmktg@gardnerdenver.com

"Over 145 Years of Leadership"

Pre-Startup Equipment Checklist for Contractor

SN # _____ **Model #** _____ **Date:** _____

Sales Order # _____ **Job Site Location:** _____

Contractor: _____ **Customer:** _____

Do not "post date" the completion date. We must know the actual date your machines will be ready for start-up. Form(s) must be returned to confirm a scheduled start-up date. Please fax to 770-631-0765.

	Date	Initials
1. Foundation level and clean		
2. Vibration pads installed and shimmed properly		
3. Base **not** bolted or grouted to pad		
4. Expansion joints installed properly (not insulated)		
5. Inlet, discharge, check valves installed in correct direction		
6. Inlet filters installed (clean)		
7. Power wiring complete to panel and motor		
8. Instrument wiring complete		
9. Equipment bumped for proper rotation		
10. MCC power available for startup		
11. Piping has been cleaned and checked		
12. O & M Manual on site		

This list **must** be completed and returned to the Gardner Denver Service Department before a Field Service Technician or Gardner Denver Representative can be scheduled to the site for startup.

_____ _____

Authorized Signature Date

Gardner Denver Engineered Products Division
100 Gardner Park, Peachtree City, GA 30269
Phone: 800-982-3009 / 770-632-5000
Fax: 770-486-5628
E-mail: blowersmktg@gardnerdenver.com

"Over 145 Years of Leadership"

Attachment 2

STARTUP CHECKLIST for GARDNER DENVER REPRESENTATIVE

SN# _____ MODEL# _____ Date_____

Sales Order # _____ Job Site Location _____

Contractor _____ Customer _____

	DATE	INITIAL	COMMENTS
1. Has installing contractor completed Pre-Startup Checklist?			
2. Check equipment for lubrication.			
3. Observe equipment powered up.			
4. Are plant operations ready for process (gas or vacuum)?			
5. Do instruments have proper set points encoded.			
6. If location is to be started by Gardner Denver Representative the following apply: **a. Equipment Alignment** **b. Function check alarms, shut downs and Equipment protection devices, setpoints.** **c. Complete Run Test Data Sheets and Startup Service Report. Be sure dates are included.** **d. Complete Training obligations.**			
7. If location is to be started by Factory Technician – Call Service Department at 770-632-5000			

_____ _____

AUTHORIZED SIGNATURE DATE

Attachment F

STARTUP CHECKLIST SUMMARY

TO BE COMPLETED BY CERTIFIED GARDNER DENVER SERVICE TECHNICIAN

SN# _____ MODEL# _____ Date_____

Sales Order # _____ Job Site Location _____

Contractor _____ Customer _____

	DATE	INITIAL	COMMENTS
1. Check installation for vibration pad location and shimming.			
2. Check blower skid for pipe strain and design.			
3. Check lubrication for contamination during storage and installation.			
4. Check all valves (electrical, pneumatic, manual) for proper operation.			
5. Inspect all Protection Devices – temperature, vibratic surge and overload.			
6. Complete Cold laser alignment.			
7. Confirm Stop – Start, emergency stop stations are operational			
8. Start (blower-exhauster) and operate long enough to evaluate bearing temperature and vibration reading, verify amperage reading, check monitoring equipment for proper calibration.			
9. Hot Alignment.			
10. Operate blower at design conditions and complete Run Test Data Sheets.			
11. Function check all shut downs and demonstrate to customer proper operation of these devices.			
12. Operator and Mechanical Training, as specified.			
13. Check O & M manual – up date electrical prints (as built).			
14. Complete Testing and Startup Reports as specified .			
15. Complete vibration analysis and/or laser print out as specified.			
16. Complete training obligations – Classroom - Hands On.			

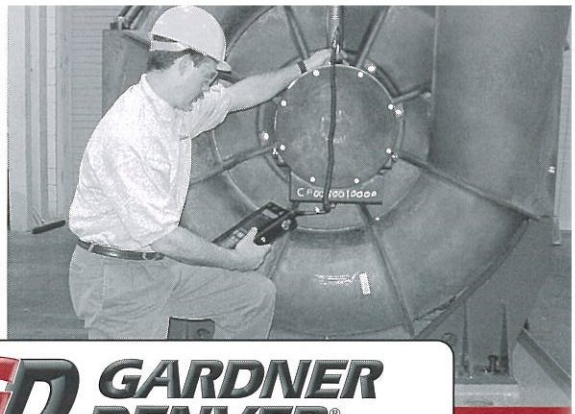
_____ _____

AUTHORIZED SIGNATURE DATE

GARDNER DENVER

WARRANTY RENEWAL PROGRAM

Exclusive to Gardner Denver, our Warranty Renewal Program provides comprehensive "insurance" for customers who want the peace of mind to know that their blowers/exhausters will be maintained to perform at top efficiency. The Gardner Denver Warranty Renewal Program is a factory service performed at your site.



GARDNER DENVER

Gardner Denver Warranty Renewal Program

Gardner Denver is the only centrifugal blower manufacturer to offer such a comprehensive preventative maintenance program. It's virtually like buying "life insurance" for your blowers. Each year, a new factory warranty is issued upon satisfactory completion of a qualifying service call. Most major brands of centrifugal blowers can be covered under this program.

Factory Service
Genuine GD Parts

WARRANTY RENEWAL PROGRAM

Factory Service and Parts

Service is performed at your site by skilled factory technicians who understand blowers. These specially trained Gardner Denver technicians also provide other cost-saving services such as maintenance personnel training and advice on how to optimize system efficiency at your facility. In addition, only genuine Gardner Denver parts and factory-recommended lubricants are used on any repair or maintenance work.

Save Time and Money

On-site service means less downtime and no costly freight charges. On average, the annual cost of this program is less than the cost of one emergency service call.

Peace of Mind Now and for the Future

A new factory warranty is issued annually after satisfactory completion of a service call. This unique preventative maintenance program means that your blowers will always be maintained to perform at peak efficiency.

Gardner Denver Warranty Renewal Program

What it can mean for your operation

A major Midwest pharmaceuticals manufacturer has 13 multistage centrifugal blowers used in various processes throughout its manufacturing facility. This customer was paying in excess of $100,000 annually to a local mechanical contractor for maintenance service on their blowers. After continuing to have maintenance-related problems, the company contacted the Gardner Denver Blower Service Department for assistance. Gardner Denver sent a service technician to the customer's location where he surveyed the equipment and processes in the facility and made recommendations for future blower service.

This customer now subscribes to the Gardner Denver Warranty Renewal Program and is paying less than 10% of the former maintenance cost. The blowers are serviced in place saving valuable production time and the factory warranty never ends. What's more, Gardner Denver service technicians showed the customer how the facility could operate using two less blowers, resulting in significant energy cost savings.

Gardner Denver Factory Service Department

- 24/7 Emergency Assistance
- On-site Service
- Operation and Maintenance Training
- Consulting/Troubleshooting

Genuine Gardner Denver Parts and Lubricants

When it's time to replace the typical wear components or change the grease or oil in your blower, nothing outperforms genuine Gardner Denver factory parts and lubricants. Our skilled customer service professionals will help you make sure you receive the correct parts and accessories for your specific blower configuration.

Contact Your Gardner Denver Representative

For additional information, contact your local representative or

Gardner Denver Blower Division Customer Service
100 Gardner Park, Peachtree City, GA 30269
Toll Free 800-543-7736
Phone 770-632-5000 • Fax 770-486-5629
E-mail: blowersmktg@gardnerdenver.com
Visit our web site: www.gardnerdenver.com

For Parts Information, Contact:
Gardner Denver Blower Division Customer Service
Phone 770-632-5000 • Fax 770-631-0765

Gardner Denver

Bulletin GDCF-2-205 07032.5M

PRODUCT DATA

1 Lamson Street • P.O. Box 4857 • Syracuse, NY 13221 • Ph. 315-433-5500 • FAX 315-433-5451

LAMSON corporation
Dynamic Innovation Since 1880

CENTRIFUGAL AIR SYSTEMS

BLOWERS/ EXHAUSTERS

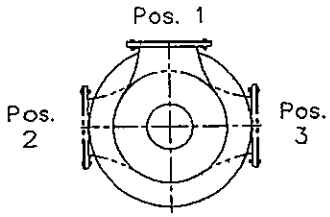
☐ For Approval ☐ Certified For

Project _____

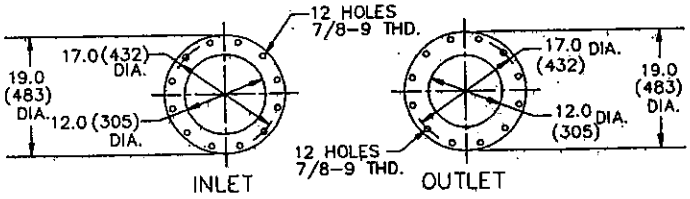
Your Order # _____

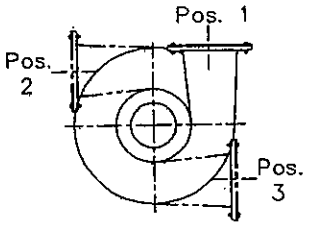
Our Order # _____ By _____

"1210" and "1250" Series Air & Gas, Inlet Driven Direct Drive - Dimensions

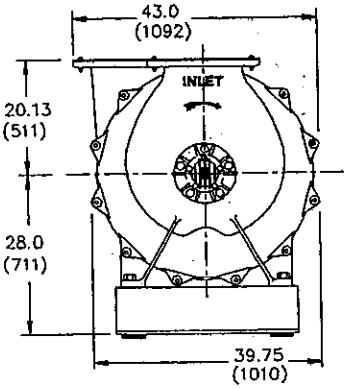


Inlet Positions
(VIEWED FROM INLET)

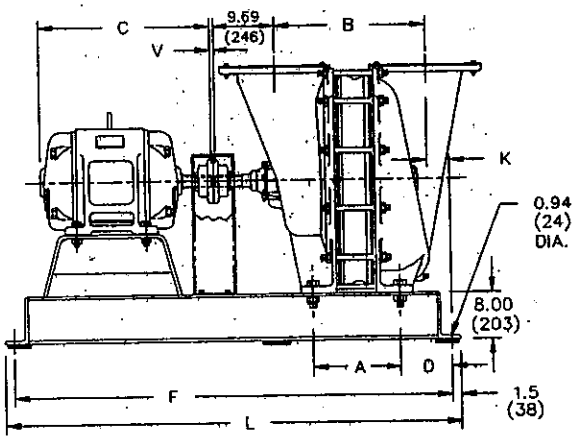


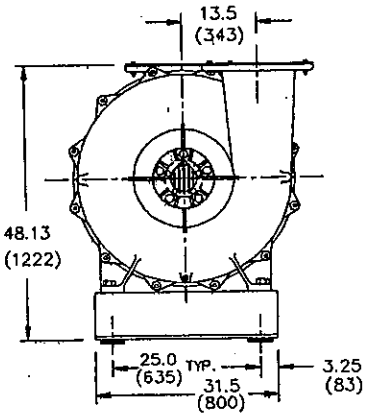


Outlet Positions
(VIEWED FROM OUTLET)



(END VIEW OF MACHINE ONLY)





Frame No.	Dimensions						
	A	B	C	D	F	L	K
1211, 1251	8.50 (216)	19.94 (506)	326TS	13.50 (343)	69 (1753)	72 (1829)	8.50 (216)
1212, 1252	14.31 (363)	25.75 (654)	405TS	13.50 (343)	77 (1956)	80 (2032)	8.50 (216)
1213, 1253	20.13 (511)	31.56 (802)	445TS	13.50 (343)	90(2286)	93 (2362)	8.50 (216)
1214, 1254	25.94 (659)	37.38 (949)	445TS	13.50 (343)	98(2489)	101(2565)	8.50 (216)
1215, 1255	31.75 (806)	43.19(1097)	447TS	19.31 (490)	114 (2896)	117(2972)	14.31 (363)
1216, 1256	37.56 (954)	49.00(1245)	447TS	13.50 (343)	114 (2896)	117 (2972)	8.50 (216)
1217, 1257	43.38 (1102)	54.82(1392)	447TS	13.50 (343)	120(3048)	123 (3124)	8.50 (216)

NOTES:
1. Column "C" lists maximum NEMA motor frame typically required for the machine indicated.
2. Dimensions in inches and (mm).
3. Flange dimensions conform to 125 pound ANSI cast iron flanged fittings.
4. Dimension "V" is distance between shaft ends which varies depending on the coupling used. Refer to coupling data sheet for more information.
5. Specifications subject to change without notice.

HOFFMAN LAMSON

Controls
Vibration Sensor
Centrifugal Products

SPECIFICATIONS

Enclosure & Rating	Stainless Steel IP68
Output	4 – 20 mA DC
Range Full Scale	0 – 1 in/sec pk
Input Power	15 – 30 VDC
Measurement	Velocity Peak Detector
Accuracy	.005 in/sec pk
Non-Linearity	1%
Temperature Range	-47°F to 257°F
Blower Conn. Interface	3/8-24 UNF x ¼" Long External Thread
Electrical Conn. Interface	2 pin MIL-C-5015
Approvals	CE Compliant
Area usage	General, not for classified areas
Field Wiring By Others	Recommend two conductor #18 AWG Belden 9318 or equal

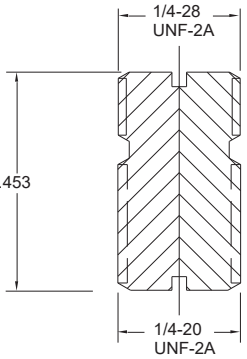
STANDARD KIT: (Includes Sensor, Stud, & Cable)

- Permits early detection during operation until scheduled maintenance, thus preventing expensive shutdowns
- Provides 4 – 20 mA output proportional to velocity
- Eliminates polarity sensitive wiring with easy cable snap connection
- Resists water contamination with easy cable snap connection
- Allows continuous use monitoring of critical unattended machines

Standard Kit Assembly	Cable Length Included
P/N VP1024035	With 10 foot cable
P/N VP1051302	With 20 foot cable
P/N VP1062964	With 25 foot cable
P/N VP1036253	With 40 foot cable

REPLACEMENT INFORMATION

- Replaces P/N's 24CA5063, 24CA5064, and VP1002144
- When replacing P/N 24CA5063, you must order the alternate mounting stud (¼-28 UNF-2B to ¼-20 UNF-2B) which is P/N VP1013946 in addition to ordering from above chart.



ALTERNATE
MOUNTING STUD
P/N VP1013946

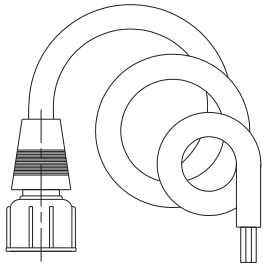
FOR REPLACEMENT
ONLY

PRODUCT NOTES

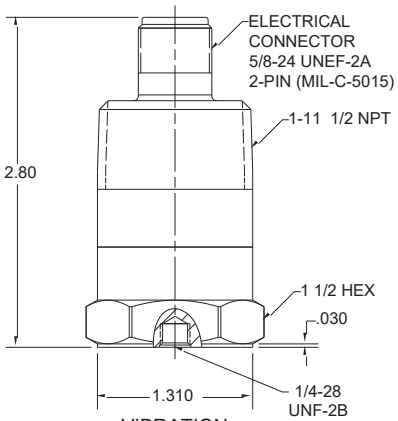
1. Information is approximate, subject to change without notice, and not for construction use unless certified
2. All dimensions are in inches and weights in pounds

DIMENSIONAL DATA

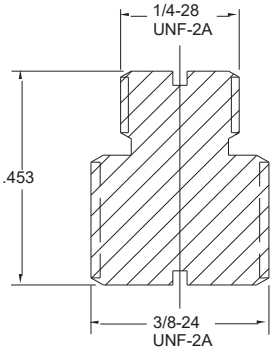
P/N VP1036344 –
10 foot cable



INTERFACE CABLE (10 feet)



VIBRATION
TRANSMITTER



P/N VP1028058 –
mounting stud only

MOUNTING STUD

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
Phone: +1 800-982-3009 / +1 724-239-1500
Fax: +1 724-239-1502
E-mail: info.HoffmanLamson@gardnerdenver.com
Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

HOFFMAN LAMSON

Controls

RTD Probe Assembly

Centrifugal Products

SPECIFICATIONS – P/N 300RGA1354

> 3-WIRE 100 OHM RTD ASSEMBLY

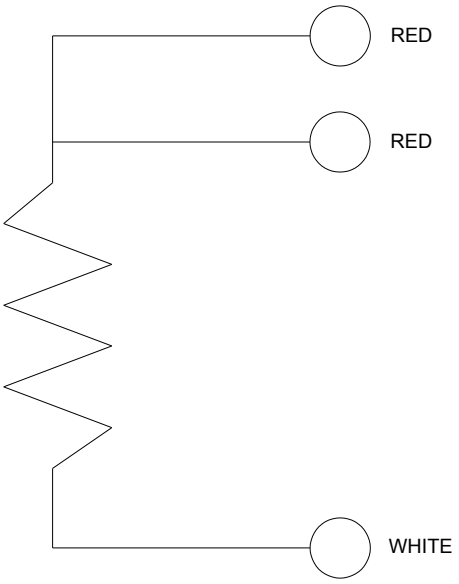
> 400°F (204°C) MAX TEMPERATURE

> INITIAL ACCURACY: ± .12% (.31°C) @ 0°C .00385 Ω/Ω/°C NOMINAL TEMPERATURE COEFFICIENT

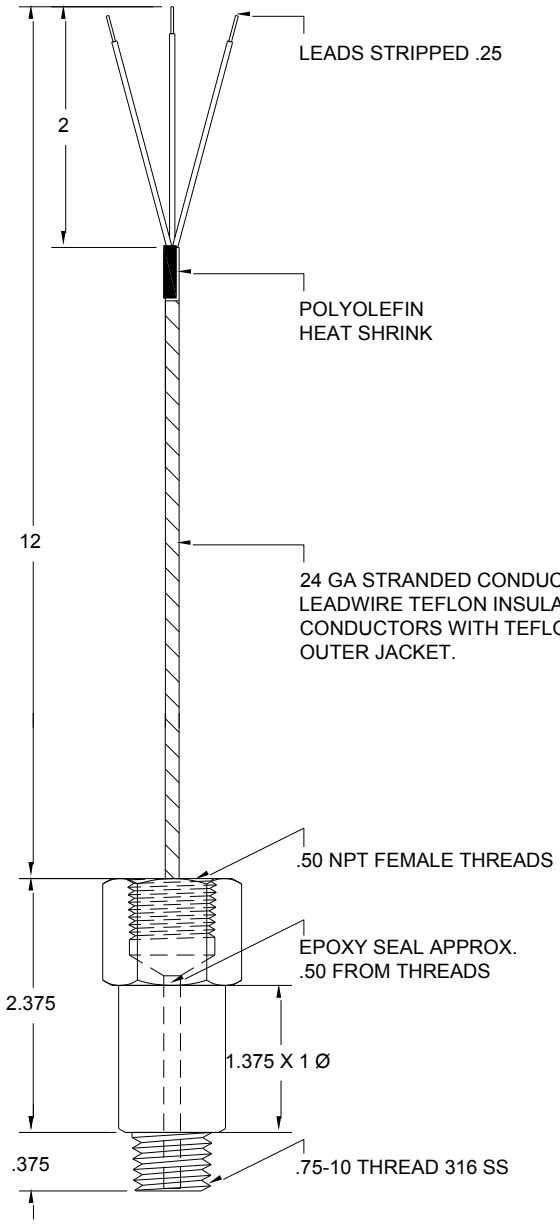
> RTD ELEMENT IS EMBEDDED IN EPOXY AND ENCASED IN A 316 SS BUSHING

> NOT FOR USE ON 2400 SERIES CENTRIFUGAL BLOWER

> FIELD WIRING BY OTHERS



DIMENSIONAL DATA



PRODUCT NOTES

1. Information is approximate, subject to change without notice, not for construction use unless certified
2. All dimensions are in inches
3. Recommended field wiring – three conductor shielded #18 AWG wire (Belden 9553 or equal)

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
Phone: +1 800-982-3009 / +1 724-239-1500
Fax: +1 724-239-1502
E-mail: info.HoffmanLamson@gardnerdenver.com
Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

HOFFMAN LAMSON

Accessories

Isolation Base Pads

Centrifugal Products

PERFORMANCE SPECIFICATIONS

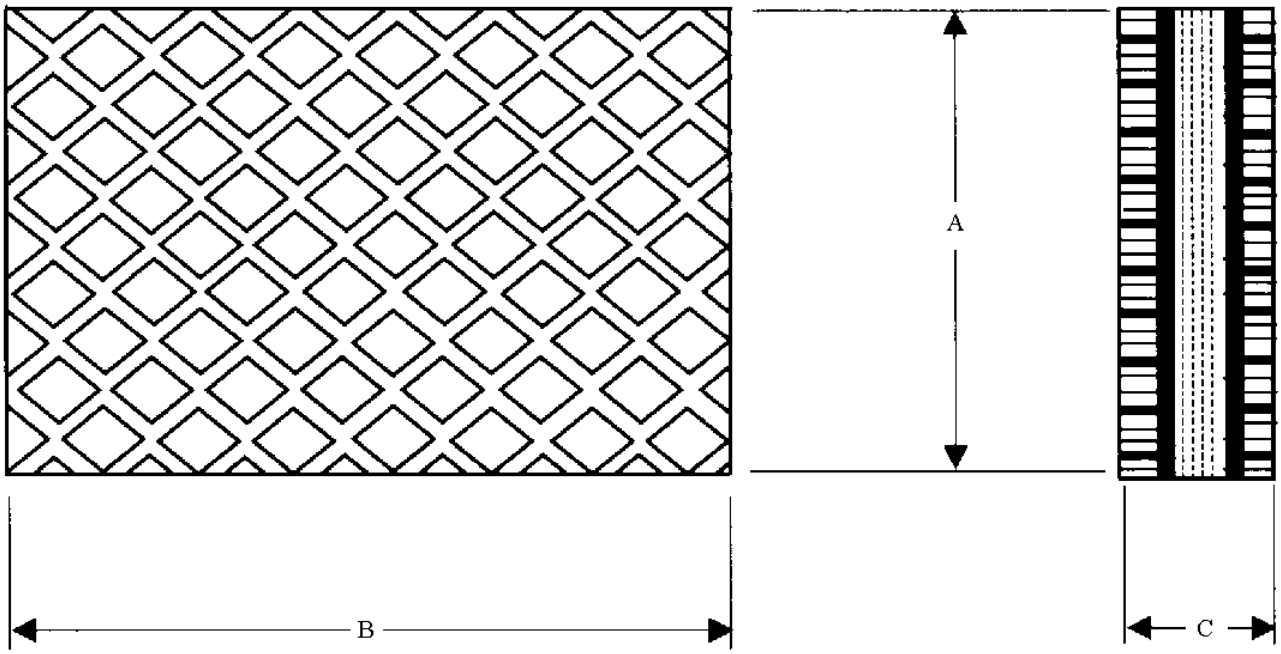
TEMP. RANGE: -20° F to 180° F (-28° C to 82° C)

LOAD RATING: 50 lbs-force / in^2 (3.5 kgs-force / cm^2)

MATERIALS OF CONSTRUCTION

ELASTOMER: ASTM D2000 Neoprene

CORK: MC-2 11# cork permanently bonded between 2 layers of waffle-tread design elastomer



PART NO.	A (in)	A (cm)	B (in)	B (cm)	C (in)	C (cm)	Area (in^2)	Area (cm^2)	Max. Load/Pad (lbs-force)	Max. Load/Pad (kgs-force)
HF00896814	3.0	7.6	3.0	7.6	1.0	2.5	9.00	58	450	203
HF20007590	2.0	5.0	8.0	20	1.0	2.5	16.00	103	800	362
HF10771055	6.0	15	8.0	20	1.0	2.5	48.00	309	2400	1087
VP1003583	1.5	3.8	1.5	3.8	1.0	2.5	2.25	14	113	51
VP1003005	4.0	10	4.0	10	1.0	2.5	16.00	103	800	362
VP1003074	6.0	15	6.0	15	1.0	2.5	36.00	232	1800	815
VP1003778	8.0	20	8.0	20	1.0	2.5	64.00	412	3200	1450

PRODUCT NOTES

1. Information is approximate, subject to change without notice, and not for construction use unless certified

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
Phone: +1 800-982-3009 / +1 724-239-1500
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Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

10–30 HP FIXED SPEED ROTARY SCREW COMPRESSORS

L-Series

Advanced Technology. Inspired Simplicity.

L-Series compressors from Champion feature more than just the latest compressor technology. They contain the cleanest, simplest, most intuitive machine layouts on the market. Equipped with standard TEFC main motors, wye-delta starters, Pilot™ microprocessor controllers and quiet enclosures, an L-Series unit from Champion is the optimal solution when a feature-rich, simple-to-operate compressor is required.

First Class Serviceability

The L-Series units set a new standard in serviceability. By utilizing integrated airend design techniques, Champion delivers unprecedented access to service items such as; a high efficiency air filter, air/oil separator and oil filter. At the same time, the compact design eliminates unneeded connections and minimizes piping; reducing the opportunity for leaks. Couple these features with standard automatic belt tensioning and you have a world class small horsepower compressor package.

Configuration Flexibility

L-Series compressors are available in base mount or AirStation™ configurations. The plug-and-play AirStation™ configuration is an L-Series compressor mounted on a horizontal receiver tank with or without a refrigerated air dryer. Featuring standard high-end and optional components such as a three-way bypass valve, stainless steel piping, integrated fork lift slots and an automatic tank drain, the L-Series AirStation™ is the ideal solution for a compressed air system that requires minimal installation time and cost.

L07–L22 ROTARY SCREW COMPRESSOR

MODEL	DRIVE MOTOR		50 Hz				60 Hz				NOISE LEVEL[2]	WEIGHT		DIMENSIONS L × W × H
			NOMINAL PRESSURE		FAD[1]		NOMINAL PRESSURE		FAD[1]					
	HP	KW	PSIG	BAR	ACFM	M³/MIN	PSIG	BAR	ACFM	M³/MIN	DB(A)	LBS	KG	IN. (MM)
L07	10	7	110 145 190	7.5 10.0 13.0	45.9 37.4 30.0	1.30 1.06 0.85	100 125 190	6.9 8.6 13.0	44.5 38.7 26.4	1.26 1.10 0.75	71	452	205	27 × 25 × 41 (686 × 635 × 1041)
L11	15	11	110 145 190	7.5 10.0 13.0	66.0 56.8 46.6	1.87 1.61 1.32	100 125 190	6.9 8.6 13.0	63.1 57.9 44.1	1.79 1.64 1.25		483	219	
L15	20	15	110 145 190	7.5 10.0 13.0	95.3 79.8 63.5	2.70 2.26 1.80	100 125 190	6.9 8.6 13.0	89.4 83.4 63.1	2.53 2.36 1.79	73	739	335	31 × 28 × 47 (787 × 711 × 1194)
L18	25	18	110 145 190	7.5 10.0 13.0	114.7 96.7 82.6	3.25 2.74 2.34	100 125 190	6.9 8.6 13.0	110.9 101.9 80.2	3.14 2.89 2.27	74	796	361	
L22	30	22	110 145 190	7.5 10.0 13.0	128.8 113.3 92.1	3.65 3.21 2.61	100 125 190	6.9 8.6 13.0	125.8 116.5 92.0	3.56 3.30 2.61		810	367	

1) Data measured and stated in accordance with ISO1217, Ed. 4, Annex C & Annex E at the following conditions:
Air Intake Pressure 1 bar A, Air Intake Temperature 20° C, Humidity 0% (Dry)
2) Measured in free field conditions in accordance with ISO 2151, tolerance +/– 3dB

AIR STATION SPECIFICATIONS, 60 HZ

MODEL	DRYER MODEL	RECEIVER SIZE GAL. (LITERS)	REFRIGERANT	WEIGHT LBS (KG)	DIMENSIONS L × W × H IN. (MM)
				120 GAL	120 GAL
L07	GSRN XCNC	80, 120, 240 (303, 454, 908)	R134A	less dryer 953 (433) with GSRN dryer 1079 (489) with XCNC dryer 1030 (467)	less dryer 73 × 32 × 66 (1854 × 819 × 1676) with dryer 72 × 32 × 66 (1829 × 819 × 1676)
L11	GSRN XCNC			less dryer 984 (446) with GSRN dryer 1128 (512) with XCNC dryer 1078 (489)	
L15	GSRN XCNC XCCY	120, 240 (454, 908)		less dryer 1240 (563) with GSRN dryer 1506 (683) with XCNC dryer 1359 (616) with XCCY dryer 1415 (642)	less dryer 72 × 32 × 72 (1829 × 813 × 1829) with dryer 72 × 32 × 72 (1829 × 813 × 1829)
L18	GSRN XCNC XCCY			less dryer 1297 (589) with GSRN dryer 1574 (714) with XCNC dryer 1471 (667) with XCCY dryer 1477 (670)	
L22	GSRN XCNC XCCY			less dryer 1311 (595) with GSRN dryer 1598 (725) with XCNC dryer 1486 (674) with XCCY dryer 1492 (677)	

Dryer on AirStation™ package has separate electrical connection and voltage.

L-Series Features (10–30 HP)

- Belt drive, oil flooded, single stage rotary screw air compressor
- RotorLube 4000 lubricant
- Air-cooled only
- Optional automatic zero-loss condensate drain (with receiver tank selection)
- CRN and ASME rated aftercooler
- Pilot™ microprocessor controller
- Integrated spin-on oil filter, spin-on air/oil separator and two-stage air filter
- Integrated thermostatic thermal mixing valve
- IP54 electrical enclosure
- Load/no load control and timed shutdown
- Moisture separator (shipped loose)
- Mounted and wired wye-delta starter
- Optional ASME receiver tank (80, 120, 240 gallons)
- Optional mounted cycling or non-cycling refrigerated dryer (with receiver tank selection)
- Quiet enclosure
- TEFC main motor
- Optional three-way bypass valve (with receiver tank and mounted dryer)
- Second pressure band control for lead/lag operation
- Stainless steel piping (with receiver tank and mounted dryer)
- UL labeled electronics (including C-UL-US open industrial control panel)
- Standard manual tank drain (with receiver tank)
- Voltage: 208/230/380/400/460/575V
*Dryer on AirStation package has separate electrical connection and voltage.

CHAMPION®

1301 North Euclid Avenue
Princeton, Illinois 61356 USA
866-276-4330
www.ChampionPneumatic.com

APPENDIX B7 - MIST ELIMINATOR PRODUCT SHEET

Industrials Product List

Series: CME Mist Eliminators
Frame: Product 01--CME Mist Eliminators

Filter Model	Pipe Size	Flow Rates @ 100 psi g	Dimension A (inches)	Dimension B (inches)	Dimension D (inches)	Weight lbs.
CME125	2" NPT	125	20.7	40.5	14.25	292
CME250	2" NPT	250	20.7	46.5	14.25	250
CME500	2" NPT	500	20.7	61.5	14.25	352
CME1000	3" FLG	1000	20.9	70.5	14.25	402
CME1200	3" FLG	1200	25.8	61.8	14.25	528
CME1500	4" FLG	1500	25.8	70.5	14.25	563
CME2000	4" FLG	2000	25.8	63	14.25	745
CME3000	4" FLG	3000	25.8	73	14.25	789

EVERETT
WASHINGTON

CITY OF EVERETT, WASHINGTON
PUBLIC WORKS DEPARTMENT

ADDENDUM NO. 1 TO
WFP AIR SCOUR BLOWER BUILDING REPLACEMENT PROJECT
WO. # UP 3813
JUNE 25th, 2024

Notice to Plan Holders:

This Addendum No. 1 contains the following revisions, additions, deletions, and/or clarifications, and is hereby made a part of the plans and specifications (Contract Documents) for the above named project and shall be taken into consideration by Bidders in submitting their bids.

Bidders shall acknowledge receipt of this Addendum No. 1 in the space provided on the Proposal. Failure to do so may subject the Bidder to disqualification of its bid.

This Addendum 1 consists of 2 pages, including all revisions, attachments and details.

The Bid date for receipt of Bids has NOT been changed by this Addendum.

PLANS

Item 1 - DRAWING SHEET M1, MECHANICAL PLAN

For Clarification - The vertical stub up length to connect the new pipe to existing should be less than 6 feet at the location shown in Photo 1/M1.

SPECIFICATIONS

Item 1 - SPECIFICATION 40 12 53 Section 2.02.B, PROCESS PIPING AND FITTINGS

Replace Section 2.02.B in its entirety with the following:

Flange end spools shall be made up of grade TP <u>316</u> stainless pipe with weld on slip-over type rolled angle face rings and rated to ANSI B16.1 class 125 standard. The angle face ring thickness shall be equal to or greater than the wall of the pipe or fitting to which it is welded, and it shall be continuously welded on both sides to the pipe or fitting.

All other requirements of the plans and specifications remain in effect.

This addendum shall be attached to and made a part of the plans and specifications and shall be acknowledged on the bidder's proposal.

Sincerely,

John Nottingham PE

Project Manager

EVERETT
WASHINGTON

CITY OF EVERETT, WASHINGTON
PUBLIC WORKS DEPARTMENT

ADDENDUM NO. 2 TO
WFP AIR SCOUR BLOWER BUILDING REPLACEMENT PROJECT
WO. # UP 3813
JULY 2nd, 2024

Notice to Plan Holders:

This Addendum No. 2 contains the following revisions, additions, deletions, and/or clarifications, and is hereby made a part of the plans and specifications (Contract Documents) for the above named project and shall be taken into consideration by Bidders in submitting their bids.

Bidders shall acknowledge receipt of this Addendum No. 2 in the space provided on the Proposal. Failure to do so may subject the Bidder to disqualification of its bid.

This Addendum 2 consists of 2 pages, including all revisions, attachments and details.

The Bid date for receipt of Bids has been changed by this Addendum. The new Bid date shall be July 16th, 2024.

PLANS

No plan changes at this time

SPECIFICATIONS

SPECIFICATION 00 11 13, ADVERTISEMENT FOR BIDS

First paragraph, first sentence.

Change Bid Opening Date from July 9th to July 16th.

All other requirements of the plans and specifications remain in effect.

This addendum shall be attached to and made a part of the plans and specifications and shall be acknowledged on the bidder's proposal.

Sincerely,

John Nottingham PE

Project Manager

EVERETT
WASHINGTON

CITY OF EVERETT, WASHINGTON
PUBLIC WORKS DEPARTMENT

ADDENDUM NO. 3 TO
WFP AIR SCOUR BLOWER BUILDING REPLACEMENT PROJECT
WO. # UP 3813
JULY 10th, 2024

Notice to Plan Holders:

This Addendum No. 3 contains the following revisions, additions, deletions, and/or clarifications, and is hereby made a part of the plans and specifications (Contract Documents) for the above named project and shall be taken into consideration by Bidders in submitting their bids.

Bidders shall acknowledge receipt of this Addendum No. 3 in the space provided on the Proposal. Failure to do so may subject the Bidder to disqualification of its bid.

This Addendum 3 consists of 5 pages, including all revisions, attachments and details.

The Bid date for receipt of Bids has NOT been changed by this Addendum.

PLANS

Item 1 - DRAWING SHEET M2, MECHANICAL PLAN

For Clarification – Notes further clarifying "Owner furnished Equipment" have been added.

Replace Sheet M2 in its entirety with the attached sheet.

Item 2 - DRAWING SHEET S3, STRUCTURAL PLAN

For Clarification – Notes amending a call-out to a section view, and further clarifying the use of an assumed local Datum have been added.

Replace Sheet S3 in its entirety with the attached sheet.

SPECIFICATIONS

Item 3 - SPECIFICATION 01 22 20, INSTALLATION OF OWNER-FURNISHED EQUIPMENT, Section 1.11.D, Bid Item 13

Replace the Bid Item description in its entirety with the following *[added text underlined for clarity]*:

Measurement and Payment: Lump Sum

The lump sum bid item for "Electrical and Controls" shall constitute full compensation for all labor, materials, tools and equipment necessary and incidental to furnish and install all Electrical and Controls work at the facility and shall include, but not be limited to, electrical permits and inspection fees, temporary generators and facilities, raceways, supports, conductors, grounding, trenching and backfill for electrical raceways, enclosed starters, disconnect switches, transformers, panelboards, variable frequency controllers, receptacles, lighting, lighting controls, access and security equipment, electrical connections for mechanical equipment, instrumentation and controls as shown on the Drawings and as described in Division 26 Electrical.

Item 4 - SPECIFICATION 01 64 10, INSTALLATION OF OWNER-FURNISHED EQUIPMENT, Section 1.01.B.1.b

Revise Section 1.01.B.1.b as follows *[added text underlined for clarity]*:

b. Blower Auxiliary Equipment for New Blower #1 includes:

Item 5 - SPECIFICATION 01 64 10, Section 1.01.B.1.c, INSTALLATION OF OWNER-FURNISHED EQUIPMENT

Revise Section 1.01.B.1.c, and subsections 1), 2) & 3) as follows *[added text underlined for clarity]*:

c. *Blower Sensor and Isolation Base Pad Equipment for both New Blower #1 and Relocated Blower #2 includes:*

1) Blower Vibration Sensor by Hoffman Lamson, Part Number VP1024035. Quantity = 4. Two sensors for each blower.

2) Blower Bearing RTD Sensor by Hoffman Lamson, Part Number BB-1028697, with Copper Washer by Hoffman Lamson, Part Number BB-1142000. Quantity = 4. Two sensors for each blower.

3) 6" x 6" x 1" Isolation Base Pads by Gardner Denver, Part Number VP1003074. Quantity = 8. For Relocated Blower #2.

CLARIFICATION QUESTIONS

Q1 - Is the owner supplying the pressure gauges for both blowers, as applicable. ***Only the pressure gage for New Blower #1 is Owner Furnished, as shown on M2.***

Q2 - Specification 11 00 10-1.03. Warranty. The specification says the contractor is responsible for warranting the equipment provided by the city. Is this the case? ***No, the warranty for owner furnished equipment is that which is agreed to between the Owner and the supplier. The Contractor's warranty is limited to the installation materials and services provided by the Contractor.***

Attachments to Addendum 3 include: Sheet M2 and Sheet S3

All other requirements of the plans and specifications remain in effect.

This addendum shall be attached to and made a part of the plans and specifications and shall be acknowledged on the bidder's proposal.

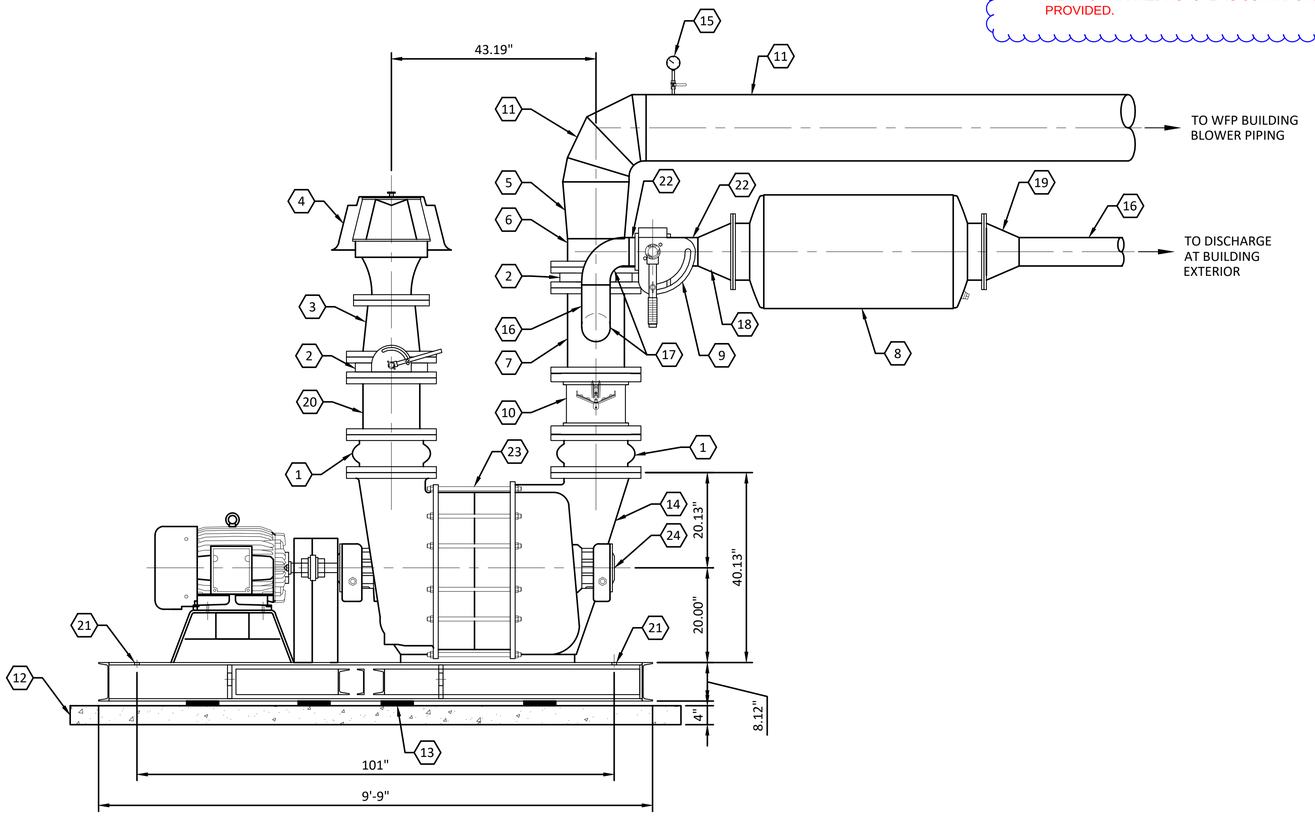
Sincerely,

John Nottingham PE

Project Manager

NOTES:

1. BLOWER ELEVATION DEPECITED IS FOR NEW BLOWER. FIELD VERIFY DIMENSIONS AND ADJUST AS NECESSARY.
2. PIPE AND EQUIPMENT SUPPORTS AND SEISMIC RESTRAINTS SHALL BE DESIGNED BY CONTRACTOR.
3. BLOWER INLET AND OUTLET FLANGES HAVE FORCE AND TORQUE LIMITIATIONS. REFER TO MANUFACTURER SPECIFICATIONS FOR DETAILS.
4. "OFE" IS OWNER-FURNISHED EQUIPMENT. ANY ITEM NOT MARKED AS "OFE" IS CONTRACTOR PROVIDED.



A / M1 BLOWER ELEVATION

SCALE: 3/4" = 1'-0"

SCALE
10 5 0 10 20
FEET

RELOCATED BLOWER #2 MATERIAL LIST

1. 12" EXPANSION JOINT, FL x FL
2. 12" BUTTERFLY VALVE W/ LEVER ACTUATOR, FL x FL
3. 12" x 10" STAINLESS STEEL REDUCER, FL x FL
4. 10" BLOWER INTAKE FILTER SILENCER, FL
5. 12" x 14" STAINLESS STEEL INCREASER, WLD x WLD
6. 12" STAINLESS STEEL SPOOL, FL x WLD
7. 12" STAINLESS STEEL PIPE W/ 6" OUTLET, FL x FL
8. 12" BLOWER DISCHARGE SILENCER, FL x FL
9. 6" BUTTERFLY VALVE W/ LEVER ACTUATOR, FL x FL
10. 12" CHECK VALVE, FL x FL
11. 14" STAINLESS STEEL PIPING, WLD x WLD
12. CONCRETE EQUIPMENT PAD
13. VIBRATION PADS, OFE (8)
14. MULTISTAGE CENTRIFUGAL AIR BLOWER, OFE
15. PRESSURE GAUGE, 1/2" NPT, INSTALLED ON SIDE OF BLOWER PIPING SO IT CAN BE VIEWED FROM THE FLOOR
16. 6" STAINLESS STEEL SPOOL, WLD x WLD
17. 6" STAINLESS STEEL 90° BEND, WLD X WLD
18. 6" x 12" STAINLESS STEEL INCREASER, WLD x FL
19. 12"x 6" STAINLESS STEEL REDUCER, FL x WLD
20. 12" STAINLESS STEEL SPOOL, FL x FL
21. 3/4" Ø ANCHOR ROD WITH 8" EMBEDMENT AND 8" CLEARANCE FROM EDGE OF EQUIPMENT PAD
22. 6" STAINLESS STEEL SPOOL, WLD x FL
23. BLOWER VIBRATION SENSOR, OFE (2)
24. BLOWER BEARING RTD, OFE (2)

NEW BLOWER #1 MATERIAL LIST

1. 12" EXPANSION JOINT, FL x FL, OFE (1 OF 2)
2. 12" BUTTERFLY VALVE W/ LEVER ACTUATOR, FL x FL, OFE
3. 12" x 10" STAINLESS STEEL REDUCER, FL x FL
4. 10" BLOWER INTAKE FILTER SILENCER, FL, OFE
5. 12" x 14" STAINLESS STEEL INCREASER, WLD x WLD
6. 12" STAINLESS STEEL SPOOL, FL x WLD
7. 12" STAINLESS STEEL PIPE W/ 6" OUTLET, FL x FL
8. 12" BLOWER DISCHARGE SILENCER, FL x FL
9. 6" BUTTERFLY VALVE W/ LEVER ACTUATOR, FL x FL
10. 12" CHECK VALVE, FL x FL, OFE
11. 14" STAINLESS STEEL PIPING, WLD x WLD
12. CONCRETE EQUIPMENT PAD
13. VIBRATION PADS, OFE (8)
14. MULTISTAGE CENTRIFUGAL AIR BLOWER, OFE
15. PRESSURE GAUGE, 1/2" NPT, OFE, INSTALLED ON SIDE OF BLOWER PIPING SO IT CAN BE VIEWED FROM THE FLOOR
16. 6" STAINLESS STEEL SPOOL, WLD x WLD
17. 6" STAINLESS STEEL 90° BEND, WLD X WLD
18. 6" x 12" STAINLESS STEEL INCREASER, WLD x FL
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20. 12" STAINLESS STEEL SPOOL, FL x FL
21. 3/4" Ø ANCHOR ROD WITH 8" EMBEDMENT AND 8" CLEARANCE FROM EDGE OF EQUIPMENT PAD
22. 6" STAINLESS STEEL SPOOL, WLD x FL
23. BLOWER VIBRATION SENSOR, OFE (2)
24. BLOWER BEARING RTD, OFE (2)

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed Z. MILES, P.E.
Drawn A. BRADLEY
Checked R. DORN, P.E.
Design Review Level

ZACHARY JOSEPH MILES — STATE OF WASHINGTON — 22056227 — REGISTERED PROFESSIONAL ENGINEER — 6/1/2024

BHC CONSULTANTS
BHC Consultants, LLC
1601 Fifth Avenue, Suite 500
Seattle, Washington 98101
206.505.3400
206.505.3406 (fax)
www.bhcconsultants.com

EVERETT PUBLIC WORKS
3200 Cedar Street
Everett, WA 98201
425.257.8800 everettwa.gov

WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

MECHANICAL

MECHANICAL ELEVATION

Drawing M2
Sheet No. 8 / 31 Of Total

Plot date 5/31/2024 1:56 PM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
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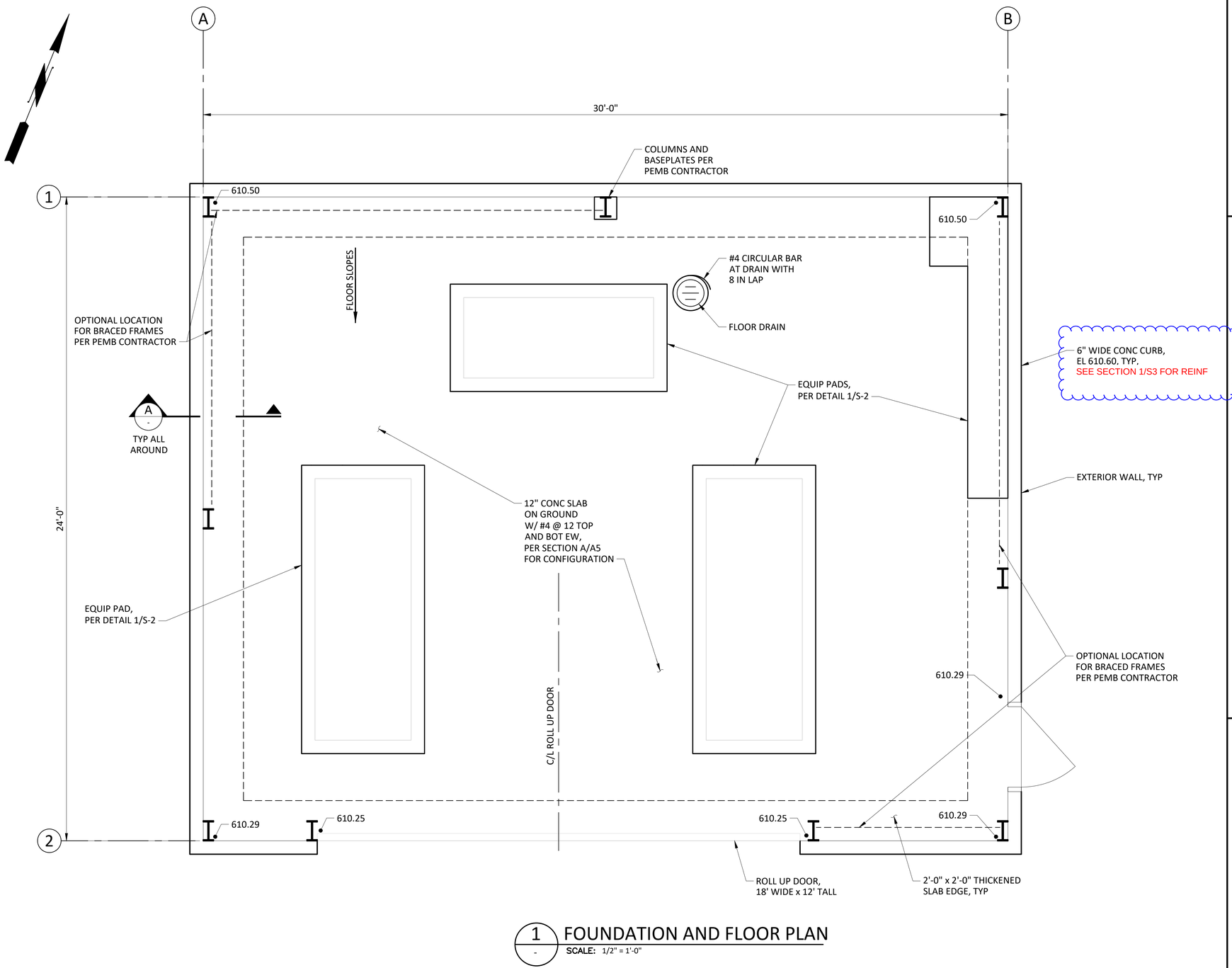
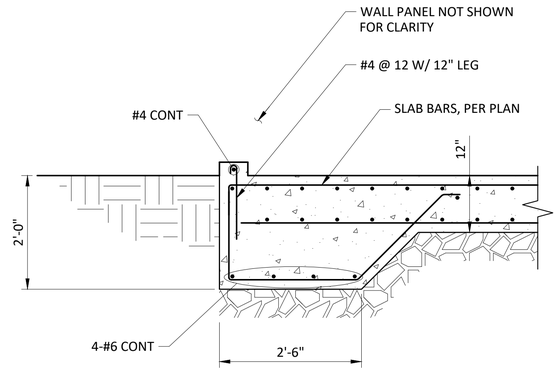


1 - FOUNDATION AND FLOOR PLAN
SCALE: 1/2" = 1'-0"

NOTES:

1. 6" MINIMUM DISTANCE FROM EQUIPMENT EDGE TO OUTSIDE OF EQUIPMENT PAD.
2. ELEVATIONS ON THIS SHEET ARE BASED ON AN ASSUMED LOCAL DATUM FROM THE ORIGINAL CONSTRUCTION AND MUST BE INCREASED BY 4.80 FEET TO COORDINATE WITH WITH NAVD 88 BASED ELEVATIONS.



A - SECTION
SCALE: NTS

NO.	DATE	APRVD	REVISION
			PLANS ISSUED FOR
BID	06-2024	JFG	
ACTION	DATE	APRVD	
CONST			
ACTION	DATE	APRVD	
RECORD			
ACTION	DATE	APRVD	

Designed Z. MILES, P.E.
Drawn A. BRADLEY
Checked R. DORN, P.E.
Design Review Level

KENNETH E. DAHL — STATE OF WASHINGTON — 23044 — PROFESSIONAL ENGINEER — 6/1/2024

BHC CONSULTANTS
BHC Consultants, LLC
1601 Fifth Avenue, Suite 500
Seattle, Washington 98101
206.505.3400
206.505.3406 (fax)
www.bhcconsultants.com

EVERETT PUBLIC WORKS
3200 Cedar Street
Everett, WA 98201
425.257.8800 everettwa.gov

WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

STRUCTURAL

FOUNDATION AND FLOOR PLAN

Drawing S3

Sheet No. 16 / 31 Of Total

Plot date 5/30/2024 4:11 PM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
Filepath\Filename S:\CAD\EVERETT\23-10858 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_S3.DWG

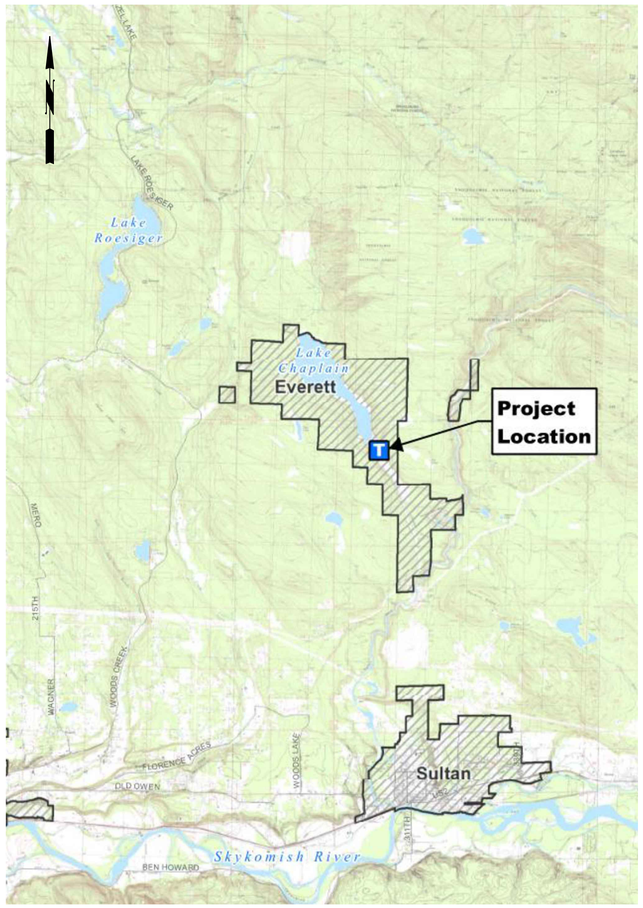
CITY OF EVERETT

PUBLIC WORKS DEPARTMENT

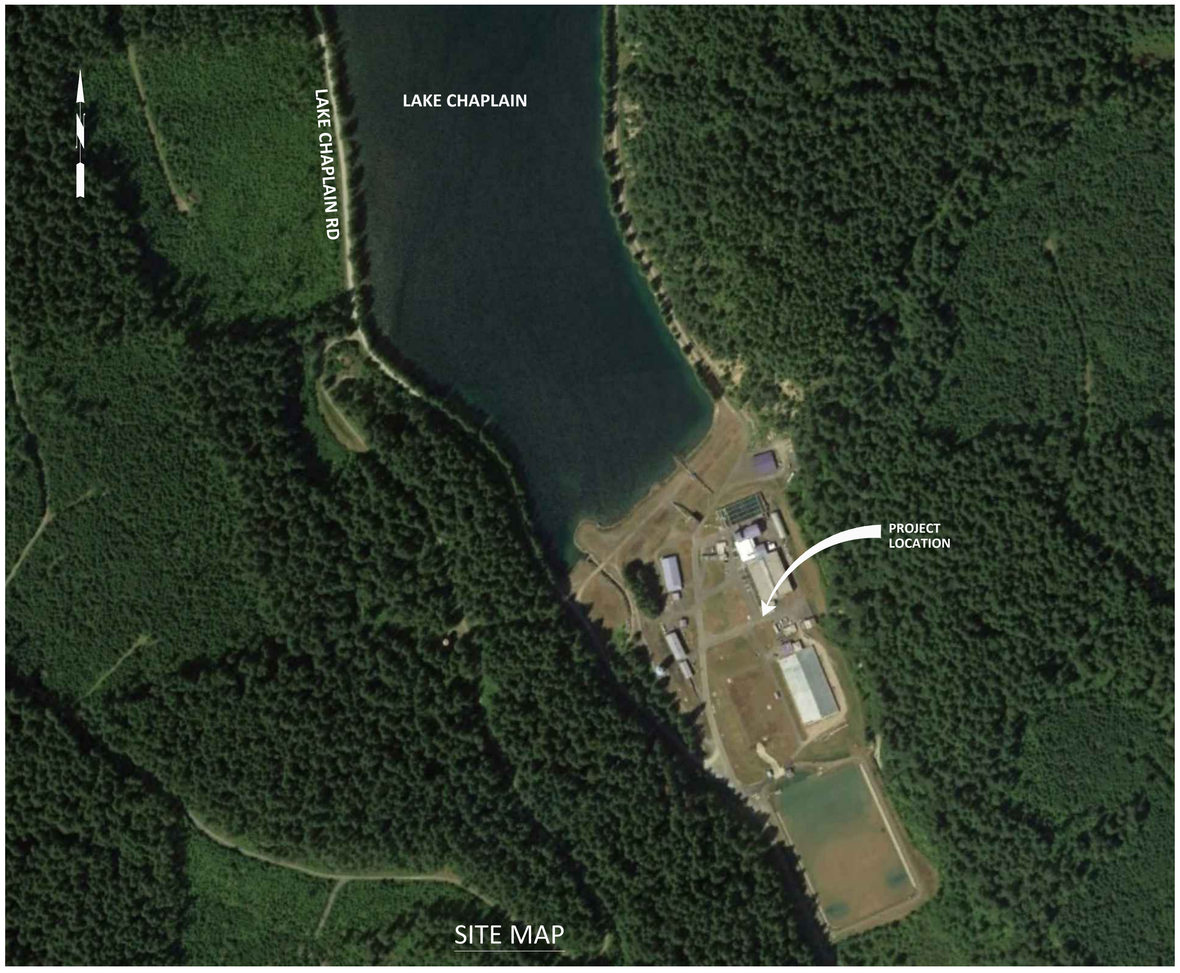
JUNE 2024

WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

WORK ORDER: UP3813



VICINITY MAP



SITE MAP

CITY OFFICIALS:

MAYOR:

CASSIE FRANKLIN

COUNCIL MEMBERS:

COUNCIL PRESIDENT
DON SCHWAB

MARY FOSSE	LIZ VOGELI
PAULA RHYNE	BEN ZARLINGO
SCOTT BADER	JUDY TUOHY

RECOMMENDED FOR APPROVAL :

PROJECT MANAGER
JOHN NOTTINGHAM, P.E.

OPERATIONS SUPERINTENDENT
JEFF MARRS

PLANT MANAGER
TOM NORRIS

CONSTRUCTION MANAGER
KEITH ALEWINE

APPROVED BY :

CITY ENGINEER
TOM HOOD, P.E.

PUBLIC WORKS DIRECTOR
RYAN L. SASS, P.E.

EVERETT
WASHINGTON

BHC Consultants, LLC
1601 Fifth Avenue, Suite 500
Seattle, Washington 98101
206.505.3400
206.505.3406 (fax)
www.bhcconsultants.com

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID			CONST					
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD
06-2024		JFG						

Designed Z. MILES, P.E.
Drawn J. LIRA
Checked J. GILLESPIE, P.E.
Design Review Level

LIFE THREATENING EMERGENCIES: FIRST CALL 911		
EMERGENCY CONTACTS		
CALL	24 HR PHONE	FOR:
SNO COUNTY PUD	425-783-4745	ELECTRICAL
CITY OF EVERETT (DISPATCH)	425-257-8832	SS,SD,WATER, TRAFFIC & SIGNAL

CALL TWO (2) BUSINESS DAYS BEFORE YOU DIG 1-800-424-5555

811 Know what's below. Call before you dig.

JOHN F. GILLESPIE III — STATE OF WASHINGTON — 51993 — REGISTERED PROFESSIONAL ENGINEER
6/4/2024

Drawing G1
Sheet No. 1 / 31 Of Total

Plot date 6/4/2024 5:08 PM Plotted by Glenn Castillo Last saved by abradley Plot style Everett-2016.ctb Sheetset Name Everett Sheetset 2016
File path\Filename S:\CAD\EVERETT\23-10868 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_G1.DWG

INDEX OF DRAWINGS

SHEET NO.	DWG NO.	DRAWING TITLE
GENERAL		
1	G1	COVER SHEET, LOCATION AND VICINITY MAP
2	G2	INDEX OF DRAWINGS, GENERAL NOTES, AND SUBMITTAL NOTES
3	G3	LEGEND, ABBREVIATIONS, AND DESIGNATIONS
CIVIL		
4	C1	EXISTING CIVIL PLAN
5	C2	CIVIL SITE AND TESC PLAN
6	C3	CIVIL DETAILS
MECHANICAL		
7	M1	MECHANICAL PLAN
8	M2	MECHANICAL ELEVATION
ARCHITECTURAL		
9	A1	CODE SUMMARY
10	A2	ARCHITECTURAL PLAN
11	A3	ROOF PLAN
12	A4	BUILDING EXTERIOR ELEVATIONS
13	A5	BUILDING SECTION
STRUCTURAL		
14	S1	STRUCTURAL GENERAL NOTES 1 OF 2
15	S2	STRUCTURAL GENERAL NOTES 2 OF 2
16	S3	FOUNDATION AND FLOOR PLAN
17	S4	ROOF FRAMING PLAN
HVAC		
18	H1	SYMBOLS, NOTES, AND ABBREVIATIONS
19	H2	FLOOR PLAN
20	H3	SCHEDULES
21	H4	SEQUENCE OF OPERATIONS
ELECTRICAL		
22	E1	ELECTRICAL SYMBOLS AND LEGEND
23	E2	ELECTRICAL ONE-LINE DIAGRAM
24	E3	ELECTRICAL PLAN
25	E4	ELECTRICAL POWER PLAN
26	E5	ELECTRICAL LIGHTING, RECEPTACLE AND ACCESS CONTROL PLAN
27	E6	ELECTRICAL SCHEDULES
28	E7	ELECTRICAL PANEL SCHEDULES
29	E8	ELECTRICAL DETAILS
30	E9	ELECTRICAL WIRING DIAGRAMS 1 OF 2
31	E10	ELECTRICAL WIRING DIAGRAMS 2 OF 2

GENERAL NOTES (SOURCE: 2014 CITY OF EVERETT DEVELOPMENT GUIDELINES)

1. ALL WORK AND MATERIALS SHALL CONFORM TO THE CITY OF EVERETT STANDARDS, CITY OF EVERETT MUNICIPAL CODE, THE CURRENTLY ADOPTED SURFACE WATER DESIGN MANUAL, AND WSDOT/APWA STANDARD SPECIFICATIONS, LATEST EDITION.
2. THE DESIGN ELEMENTS WITHIN THESE PLANS HAVE BEEN REVIEWED ACCORDING TO THE EVERETT DESIGN STANDARDS. SOME ELEMENTS MAY HAVE BEEN OVERLOOKED OR MISSED BY THE CITY OF EVERETT CITY ENGINEER. ANY VARIANCE FROM ADOPTED STANDARDS IS NOT ALLOWED UNLESS SPECIFICALLY APPROVED BY THE CITY OF EVERETT CITY ENGINEER, PRIOR TO CONSTRUCTION.
3. APPROVAL OF THESE GRADING AND DRAINAGE PLANS DOES NOT CONSTITUTE AN APPROVAL OF ANY OTHER DESIGN (E.G., WATER, SEWER, GAS, ELECTRICAL, ETC.).
4. BEFORE ANY CONSTRUCTION OR DEVELOPMENT ACTIVITY, A PRECONSTRUCTION MEETING SHALL BE HELD BETWEEN THE CITY OF EVERETT PUBLIC WORKS DEPARTMENT, THE CONTRACTOR AND THE CONTRACTOR'S CONSTRUCTION REPRESENTATIVE.
5. PROOF OF LIABILITY INSURANCE SHALL BE SUBMITTED TO THE CITY OF EVERETT PRIOR TO THE PRE-CONSTRUCTION MEETING.
6. A COPY OF THESE APPROVED PLANS SHALL BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
7. CONSTRUCTION NOISE SHALL COMPLY WITH THE CURRENT EVERETT NOISE ORDINANCE, EMC CHAPTER 20.08.
8. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ALL RIGHT-OF-WAY PERMITS AND CONSTRUCTION EASEMENTS NECESSARY BEFORE INITIATING OFF-SITE WORK WITHIN A CITY OF EVERETT STREET RIGHT-OF-WAY.
9. FRANCHISED UTILITIES OR OTHER INSTALLATIONS THAT ARE NOT SHOWN ON THESE APPROVED PLANS SHALL NOT BE CONSTRUCTED UNLESS AN APPROVED SET OF PLANS IS SUBMITTED TO THE CITY OF EVERETT PRIOR TO CONSTRUCTION.
10. DATUM SHALL BE NAVD 1988 UNLESS OTHERWISE APPROVED BY THE CITY OF EVERETT.
11. ALL UTILITY TRENCHES SHALL BE BACKFILLED AND COMPACTED IN ACCORDANCE WITH THE CITY OF EVERETT STANDARD UNLESS MORE STRINGENT REQUIREMENTS ARE IMPOSED BY THESE PLANS AND SPECIFICATIONS.
12. ALL ROADWAY SUBGRADE SHALL BE BACKFILLED, COMPACTED TO 95% MAXIMUM DENSITY AND PREPARED FOR SURFACING IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION 2-06.3 UNLESS MORE STRINGENT REQUIREMENTS ARE IMPOSED BY THESE PLANS AND SPECIFICATIONS.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. REFER TO "TRAFFIC CONTROL," OF THE WSDOT STANDARD SPECIFICATIONS SHALL APPLY IN ITS ENTIRETY. TRAFFIC CONTROL PLANS SHALL FOLLOW THE CURRENTLY ADOPTED MUTCD MANUAL AS APPLICABLE.

SURVEY GENERAL NOTES

1. ALL EXISTING AND PROPOSED SITE ELEVATIONS ARE SHOWN IN NGVD 29 DATUM.
2. CONTRACTOR SHALL CONVERT AS-BUILT ELEVATIONS TO NAVD 88 DATUM.

SUBMITTAL NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURACY AND COMPLETENESS OF THE INFORMATION CONTAINED IN EACH SUBMITTAL AND SHALL ASSURE THAT THE MATERIAL, EQUIPMENT OR METHOD OF WORK SHALL BE AS DESCRIBED IN THE SUBMITTAL. THE CONTRACTOR SHALL VERIFY THAT ALL FEATURES OF ALL PRODUCTS CONFORM TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. SUBMITTAL DOCUMENTS SHALL BE CLEARLY EDITED TO INDICATE ONLY THOSE ITEMS, MODELS, OR SERIES OF MATERIALS, WHICH ARE BEING SUBMITTED FOR REVIEW. ALL INFORMATION NOT SPECIFICALLY PERTAINING TO THE SUBMITTED MATERIALS SHALL BE CROSSED OUT OR OTHERWISE REMOVED. THE CONTRACTOR SHALL ENSURE THAT THERE IS NO CONFLICT WITH OTHER SUBMITTALS AND NOTIFY THE ENGINEER IN EACH CASE WHERE HIS SUBMITTAL MAY AFFECT THE WORK OF ANOTHER CONTRACTOR OR THE OWNER. THE CONTRACTOR SHALL ENSURE COORDINATION OF SUBMITTALS AMONG THE RELATED CRAFTS AND SUBCONTRACTORS. IF THE CONTRACTOR PROPOSES TO PROVIDE MATERIAL OR METHOD OF WORK, WHICH DEVIATES FROM THE PROJECT REQUIREMENTS, HE SHALL INDICATE SO ON THE TRANSMITTAL FORM ACCOMPANYING THE SUBMITTAL. IT IS RECOMMENDED THAT MATERIALS OR PARTS NOT BE ORDERED PRIOR TO REVIEW AND ACCEPTANCE BY THE ENGINEER. CORRECTIONS OR COMMENTS MADE ON THE PROJECT DATA SUBMITTALS AND SHOP DRAWINGS DURING THIS REVIEW DO NOT RELIEVE THE CONTRACTOR FROM HIS/HER OBLIGATION TO FULLY PERFORM ALL CONTRACT REQUIREMENTS, AND TO COMPLY WITH APPLICABLE LAWS, CODES, AND REGULATIONS. NEITHER THE REVIEW OF THE CONTRACTOR'S SUBMITTAL NOR THE CORRECTIONS OR COMMENTS PROVIDED HEREIN, SHALL CREATE ANY DUTY OWED TO OR A CAUSE OF ACTION IN FAVOR OF THE CONTRACTOR OR ANY SUBCONTRACTOR.

CONSTRUCTION SEQUENCING

1. THE EXISTING BLOWER AND CONTROL SYSTEMS WILL REMAIN IN USE DURING THE CONSTRUCTION OF THE NEW SCOUR BLOWER BUILDING.
2. THE OWNER HAS PRE-PURCHASED AND WILL FURNISH TO THE CONTRACTOR THE NEW BLOWER AND COMPRESSOR SYSTEMS PRIOR TO THE START OF CONSTRUCTION.
3. THE CONTRACTOR WILL PROVIDE THE BUILDING, ELECTRICAL DISTRIBUTION EQUIPMENT, AND WILL NEED TO INITIATE PROCUREMENT OF THESE (AND ANY OTHER) LONG-LEAD ITEMS IMMEDIATELY UPON AWARD OF THE CONSTRUCTION CONTRACT.
4. THE EXISTING BURIED WATER LINE WILL BE RELOCATED BY THE OWNER PRIOR TO CONSTRUCTION.
5. CONSTRUCT UNDERGROUND UTILITIES, THE NEW BUILDING FOUNDATION, BUILDING STRUCTURE, AND ROOF, INCLUDING LOUVERS AND FAN(S).
6. INSTALL NEW BLOWER AND BLOWER PIPING INSIDE THE NEW BUILDING. INSTALL NEW EXTERIOR BLOWER PIPING ALONG FACE OF THE EXISTING WFP BUILDING. TEMPORARILY CAP NEW BLOWER PIPING ADJACENT TO CONNECTION TO EXISTING BLOWER PIPING TO FACILITATE NEW BLOWER TESTING.
7. INSTALL NEW COMPRESSOR SYSTEM AND PIPING.
8. INSTALL NEW POWER DISTRIBUTION PANEL AND VFDS. PROVIDE A TEMPORARY CONTROL WIRE CONNECTION FOR THE NEW BLOWER VFD FROM THE EXISTING SCOUR BLOWER CONTROL PANEL IN THE EXISTING SCOUR BLOWER BUILDING.
9. INSTALL LIGHTS, RECEPTACLES, HVAC CONNECTIONS.
10. PROVIDE TEMPORARY POWER FROM A PORTABLE GENERATOR TO NEW ELECTRICAL. TEST NEW BLOWER SYSTEM AND CONTROL PANEL ON TEMPORARY (GENERATOR) POWER. PERMANENT POWER WILL REMAIN CONNECTED TO THE EXISTING BLOWER SYSTEM UNTIL THE NEW BLOWER IS CONFIRMED TO BE FULLY OPERATIONAL ON TEMPORARY POWER. CONNECT NEW BLOWER PIPING TO EXISTING BLOWER PIPING AND TEMPORARILY CAP THE EXISTING BLOWER PIPING ADJACENT TO THE CONNECTION POINT.
11. PERFORM PERMANENT POWER CUTOVER TO NEW BUILDING. SHUT OFF POWER TO PAD-MOUNTED TRANSFORMER. REMOVE SERVICE CONDUCTORS FROM TRANSFORMER TO EXISTING MCC. CONNECT UTILITY POWER TO NEW 480 VOLT PANEL BY CONNECTING CONDUITS FROM THE PAD-MOUNTED TRANSFORMER VAULT TO THE NEW PANEL AND INSTALLING NEW SECONDARY CONDUCTORS. TEST THE NEW BLOWER SYSTEM ON UTILITY POWER.
12. RELOCATE THE EXISTING FIBER OPTIC TERMINATION CABINET AND PLC CONTROL PANEL FROM THE EXISTING BUILDING TO THE NEW BUILDING. INSTALL NEW FIBER OPTIC CABLES. DURING THE RELOCATION, THE NEW BLOWER WILL BE OPERATED MANUALLY REPAIR WALL OPENINGS ON EXISTING BUILDING.
13. RELOCATE THE EXISTING BLOWER TO NEW BLOWER BUILDING AND CONNECT TO NEW VFD AND RELOCATED CONTROL PANEL AND TEST OPERATION OF BOTH BLOWERS REMOVE EXISTING BLOWER PIPING FROM INTERIOR AND EXTERIOR OF THE EXISTING BUILDING AND REPAIR THE WALL OPENING.
14. DEMOLISH THE EXISTING MCC. RECONNECT THE EXISTING LIGHTING, VENTILATION FAN, RECEPTACLES, ETC. IN THE EXISTING BUILDING TO NEW BUILDING PANEL FED FROM THE NEW PANELS.
15. PERFORM FINAL SITE RESTORATION, INCLUDING GRAVELING AND HYDROSEEDING.

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID			CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD
	06-2024	JFG						

Designed Z. MILES, P.E.
Drawn J. LIRA
Checked R. DORN, P.E.
Design Review Level

HOLLY F. GILLESPIE III — STATE OF WASHINGTON — 21993 — REGISTERED PROFESSIONAL ENGINEER — 6/1/2024

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

GENERAL

INDEX OF DRAWINGS, GENERAL NOTES, AND SUBMITTAL NOTES

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Plot date 5/30/2024 12:32 PM Plotted by Svetlana Olsce Last saved by abradley Plot style Everett 2016.stb Sheetset Name Everett Sheetset 2016
Filepath\Filename S:\CAD\EVERETT\23-108\8 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_G2.DWG

PLANS LAYOUT SYMBOLS AND CALLOUTS

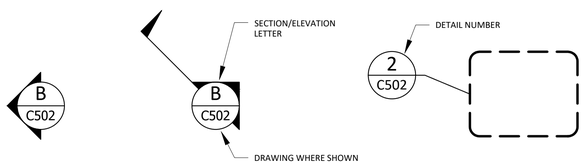
SYMBOL	DESCRIPTION (ABBR)
NOTE CALLOUTS	
2	POLE NOTE
5	CONSTRUCTION NOTE
P4	STRIPING NOTE
4	CONDUIT NOTE
27	SIGN NOTE
P4VHM	CABLE TRACE NO.
1	CABLE TRACE NO.
3	PAVEMENT REPLACEMENT NOTE

NAD 83/91
NAVD 88

SCALE

DETAIL, SECTION & ELEVATION CALLOUTS

ON PLAN SHEETS



PLAN VIEW TITLE
SCALE: 1"=20'-0"

EVERETT AVE. PROFILE
STA 0+00 TO STA 22+00
SCALE: HORIZ: 1"=20' VERT:1"=5'

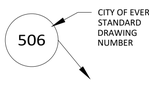
ON DETAIL SHEETS

WITHIN DETAILS

SECTION A-A PLAN DETAIL 1

CITY OF EVERETT STANDARD DETAIL PLAN CALLOUT

AS SHOWN ON PLAN SHEET



CITY OF EVERETT STANDARD DETAILS MAY BE REFERRED TO IN PLANS WITH THE USE OF THE ADJACENT CALLOUT. CITY STANDARD DRAWINGS CAN BE FOUND AT EVERETTWA.GOV OR APPEAR IN THE BACK OF PROJECT SPECIFICATION.
WHEN SUCH A DETAIL IS SHOWN IN THE PLAN SET IT BECOMES A PROJECT SPECIFIC DETAIL

BASE MAP SYMBOLS

SURVEY & CONTROL

MONUMENTS & POINTS

- ANGLE POINT (W/ N & E)
- BENCH MARK (W/ BN#, N, E & EL)
- REBAR/IRON PIPE (W/ N & E)
- MONUMENT IN CASE (W/ #, N, E & EL)
- MONUMENT SURFACE (W/ #, N, E & EL)
- SURVEY POINT (PK NAIL, SHINER, TACK ETC)
- SPOT ELEVATION (W/ ELEV)

SECTION DATA

- SECTION CENTER (W/ DNR#, N & E)
- SECTION CORNER (W/ DNR#, N, E, SEC#'S)
- QUARTER CORNER (W/ DNR#, N, E & SEC#'S)
- SIXTEENTH CORNER (#, N & E)
- CLOSING CORNER (W/ DNR#, N, E & SEC#'S)
- MEANDER CORNER (W/ DNR#, N, E & SEC#)

PLAT DATA

- A — PLAT BLOCK NO (W/ #)
- TAX LOT OWNERSHIP TIE
- ? — TAX LOT / PARCEL NUMBER (W/ #)

TOPOGRAPHIC & UTILITY

PIPING

- CAP/PLUG
- GUARD POST (BOLLARD)
- REDUCER
- THRUST BLOCK
- WATER METER
- FIRE HYDRANT
- FIRE DEPT. CONNECTION
- AIR RELIEF
- BLOW-OFF
- VALVE (TYPE=G, W, PIV)
- P.R.V.
- BENDS (11-1/4°, 22-1/2°, 45°, OR 90°)
- FLANGE CONNECTION
- MECHANICAL CONNECTION
- COUPLING
- TEE
- WYE
- CROSS

TYP CALLOUTS

8"x6"TEE (FxMJ)
3" 22 1/2° BEND (ALL F)
8" GV (F)

SS AND SD

- SAN. SEWER CLEAN OUT (NORMAL & IN PAVEMENT)
- MANHOLE (TYPES 1, 2 & 3)
- CATCHBASIN (TYPE 2)
- CATCHBASIN (TYPES 1 & 1P) STORM DRAIN INLET
- CATCHBASIN (TYPE 1L)
- STORM DRAIN CULVERT
- CULVERT TRASH RACK OR OPEN END

VAULTS

- UG VAULTS (TYPE 444LA & 504LA,)
- TY? — UTILITY VAULT (TEL, TLM, SIG, WTR, GAS ETC)

ELECTRICAL

- JUNCTION BOX (TYPE 1, 2, 3 & SPECIAL)
- PAD MOUNTED TRANSFORMER
- TRANSMISSION TOWER
- UTILITY POLE
- UTILITY POLE W/RISER
- UTILITY POLE ANCHOR
- UTILITY POLE SIDEWALK ANCHOR
- STREET LIGHT ON UTILITY POLE
- STREET LIGHT ON SEPARATE POLE
- WALL MOUNTED LIGHT
- TELEPHONE RISER
- YARD LIGHT
- DECORATIVE STREET LIGHT
- ELECTRICAL SERVICE CABINET

- CRUSHED SURFACING TOP COURSE
- EXISTING HMA

SIGNAL

6' SQ 6' DIA

- DIPOLE DETECTOR
- DIPOLE DETECTOR (6' x VAR')
- DIPOLE DETECTOR (6' x VAR')
- QUADRUPOLE DETECTOR (6' x VAR')
- BICYCLE DET LOOPS (2' x 12')
- EVP INDICATOR LIGHT
- OPTICOM SENSOR
- SONIC DETECTOR
- PEDESTRIAN SIGNAL HEAD (TYPE E, B & C)
- R/R CROSSING GATE
- CONTROLLER (TYPE 30,332,336,G,M & P)
- TELEMETRY CABINET (24"Wx46"Hx10"D)
- SERVICE CABINETS (ON FOUNDATION OR POLE)
- TRAFFIC SIGNAL POLE (TYPE 2)
- SIGNAL POLE W/LUM (TYPE 3)
- SIGNAL POLE (TYPE 1)
- SIGNAL STRAIN POLE (TYPE 4) (STEEL OR WOOD)
- PEDESTRIAN POLES (TYPE PPB & PS)
- VEHICLE SIGNAL HEAD
- VEHICLE SIGNAL HEAD W/ARROW INDICATOR
- 4 WAY FLASHER

GEOTECHNICAL

- B# — SOIL BORING
- TP# — SOIL TEST PIT
- #__ — PAVEMENT CORING
- NO — MONITORING WELL (TYPE, TOP, DEPTH)

LANDSCAPING

- ROCKERY
- HEDGE
- SHRUB
- BUSH
- TREE (Conifer) W/ & W/O 10'DIA DRIP LINE
- TREE (Deciduous) W/ & W/O 10'DIA DRIP LINE

MISCELLANEOUS

- BUS SHELTER — BUS STOP
- MAIL BOX
- TB — TELEPHONE BOOTH
- EMBANKMENT
- RIP RAP

PAVEMENT MARKINGS

- BIKE PATH
- DISABLED SYMBOL
- H.O.V. LANE SYMBOL
- ONLY — ONLY LEGEND
- STOP — STOP LEGEND
- SCHOOL — SCHOOL LEGEND
- R X R — RAILROAD CROSSING
- STRAIGHT ARROW
- LT.RT.STR.ARROW
- LEFT-STRAIGHT ARROW
- RIGHT-STRAIGHT ARROW
- LEFT-RIGHT ARROW
- 2-WAY LEFT TURN
- LEFT TURN ARROW
- RIGHT TURN ARROW

CROSSWALK LINES

- COE (2' x 10')
- DOT
- SNO CTY

RAISED PAVEMENT MARKERS: (RPM)

- LANE MARKERS TYPE I
- LANE MARKERS TYPE II

SIGNS

- ILLUMINATED MASTARM SIGN
- MASTARM ST NAME SIGN
- MASTARM MOUNTED SIGN
- SIGN W/ & W/O SINGLE POST
- SIGN W/TWO POSTS
- SIGN ON SN BRIDGE
- ST NAME INTX SIGN
- TYPE 1, 2 OR BARRICADE
- SINGLE OR DOUBLE SIDED
- TEMP W/ BASE

TEXT SYMBOLS

Ø	PHASE, DIAMETER
&	AND
'	FEET, MINUTES
"	INCHES, SECONDS
°	DEGREE

STANDARD ABBREVIATIONS

A

AB	ANCHOR BOLT
ABBR	ABBREVIATION
ABAND	ABANDONED
ABUT	ABUTMENT
ACT	ACTUAL
ADD	ADDENDUM, ADDITION
ADJ	ADJUST
AFF	ABOVE FINISH FLOOR
AH	AHEAD
ALT	ALTERNATE
ALY	ALLEY
AMEND	AMENDMENT
AP	ANGLE POINT
APPROX	APPROXIMATELY
APWA	AMERICAN PUBLIC WORKS ASSOC
ARCH	ARCHITECTURE
ARV	AIR RELIEF VALVE
ASPH	ASPHALT
AUX	AUXILIARY
AVE	AVENUE
AVAR	AIR VACUUM, AIR RELEASE
AVG	AVERAGE
AWG	AMERICAN WIRE GAUGE RD

B

B	BLACK
BC	BLOCK CORNER
BITUM	BITUMINOUS
BK	BACK
BL	BLUE
BLDG	BUILDING
BLVD	BOULEVARD
BLK	BLOCK
BOC	BACK OF CURB
BOW	BACK OF WALK
BOL	BOLLARD
BM	BENCH MARK
BOC	BACK OF CURB
BOL	BOLLARD
BOT	BOTTOM
BOW	BACK OF WALK
BRDG	BRIDGE
BRG	BEARING
BRK	BREAK
BTWN	BETWEEN

C

C	CONDUCTOR
CAP	CAPACITY
CB	CATCH BASIN, CABLE
CB1	CATCH BASIN TYPE 1
CB2	CATCH BASIN TYPE 2
CC	CENTER TO CENTER
CCb	COAXIAL CABLE
CCd	CONTROL CONDUIT
CCG	CONCRETE CURB & GUTTER
CCL	CREEK CENTER LINE
CD	CONDUIT
CGC	CURB & GUTTER
CHG	CHANGE
CHK	CHECK
CI	CAST IRON
CICL	CAST IRON CONCRETE LINED
CIP	CAST IN PLACE
CIR	CIRCUIT, CIRCLE
CJ	CONSTRUCTION JOINT
CLY	CLAY
CLF	CHAIN LINK FENCE
C/L, CL	CENTERLINE
CLR	CLEARANCE, CLEAR
CLS	CLASS, CHLORINE SOLUTION
CMP	CORRUGATED METAL PIPE CONC
CMU	MASONRY UNIT
CND	CONDUIT
CNTY	COUNTY
CO	CLEAN OUT
COE	CITY OF EVERETT
COL	COLUMN
COM	COMMON
COMM	COMMUNICATE
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCT
CONT	CONTINUED, CONTINUOUS
COOR	COORDINATE
COP	COPPER
COR	CORNER
CORR	CORRUGATED
CRN	CROWN OF ROAD
CS	COMBINED SS & SD SYSTEM
CT	CENTER
CTR	COURT
CU	CUBIC
CULV	CULVERT
CYL	CYLINDER

D

D	DEPTH, DIPOLE
DB	DIRECT BURIAL CABLE
DBL	DOUBLE
DCL	DITCH CENTERLINE
DE	DE ENERGIZE
DEG	DEGREE
DET	DETAIL
DI	DUCTILE IRON
DIA	DIAMETER
DIAPH	DIAPHRAGM
DIR	DIRECTION
DN	DOWN
DR	DRAIN, DRIVE
D/L	DAYLIGHT
DW, D/W	DRIVEWAY
DWG	DRAWING

E

E	EAST, ELECTRICAL
EA	EACH
ECb	ELECTRICAL CABLE
ECC	ECCENTRIC
EF	EACH FACE
EL	EASEMENT LINE
ELB	ELBOW
ELJB	ELECTRICAL JB
ELEV	ELEVATION
EMH	ELECTRICAL MH
ENCL	ENCLOSE
ENG	ENGINE
ENGR	ENGINEER
EMB	EMBANKMENT
EO	EDGE OF
EOA	EDGE OF ASPHALT
EOC	EDGE OF CONCRETE
EOD	EDGE OF DIRT
EOG	EDGE OF GRAVEL
EP	EDGE OF PAVEMENT
EQ	EQUAL
EQUIP	EQUIPMENT
EV	ELECTRICAL VAULT
EVP	EMERGENCY VEH PRE-EMPTION
EW	EACH WAY
EX, EXIST	EXISTING
EXC	EXCAVATION
EXT	EXTERIOR, EXTENSION, EXTRUDED
EVT	EVERETT

F

F, FLG	FLANGE
FAB	FABRICATE
FND	FOUNDATION
FF	FAR FACE, FIN FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT
FIG	FIGURE
FIN	FINISH, FINISHED
FL	FOG LINE
FLD	FIELD
FLT	FILTER
FLX	FLEXIBLE
FM	FROM, FORCE MAIN
FNC	FENCE
FOC	FACE OF CURB
FOG	FOG LINE
FOW	FACE OF WALL
FP	FULL PENETRATION, FLAG POLE
FT	FEET/FOOT
FTG	FOOTING
FWD	FORWARD
FWPS	FINISHED WATER PUMP STATION
FWY	FREEWAY

G

G	GAS LINE, GREEN
GA	GAUGE
GALV	GALVANIZED
GARG	GARAGE
GB	GREEN W/BLACK TRACER GRAVEL
GDWY	DRIVEWAY
GE	GRATE ELEVATION
GEN	GENERATOR
GI	GALVANIZED IRON
GL	GAS METER
GLV	GALV IRON
GL	GUTTER LINE, GLASS
GLV	GLOBE VALVE
GM	GAS METER
GR	GUARD RAIL
GRD	GROUND
GV	GAS VALVE
GVL	GRAVEL
GVT	GAS VAULT

H

H	HEIGHT
H-T	HUB & TACK
HAP	HORIZONTAL ANGLE POINT
HD	HEAD
HDCP	HANDICAP SYM
HDG	HOT DIPPED GALV
HI	HEIGHT OF INSTRUMENT
HORIZ	HORIZONTAL
HPS	HIGH PRESSURE SODIUM
HSB	HIGH STRENGTH BOLT
HSE	HOUSE
HT	HEIGHT
HTS	HEIGHTS
HW	HOT WATER
HWY	HIGHWAY
HYDR	HYDRAULIC

I

I	IRON
ID	INSIDE DIAMETER
IDENT	IDENTIFICATION
IE	INVERT ELEV
IF	INSIDE FACE
IL	INLET
ILLUM	ILLUMINATE
IMSA	INTERNATIONAL MUNICIPAL SIGNAL ASSOC.
IN	INCH/INCHES
INCL	INCLUDE
INCR	INCREASE
IND	INDICATOR
INDUCT	INDUCTANCE
INST	INSTALL, INSTRUMENT
INSUL	INSULATION
INT	INTERSECTION, INTERNAL
INV	INVERT, INVERSE
IP	IRON PIPE
IS	ISLAND
ITE	INSTITUTE OF TRANSPORTATION ENGINEERING

J

JNX	JUNCTION
JB	JUNCTION BOX
JCT	JUNCTION
JT	JOINT

K

KG	KILOGRAM
KHZ	KILOHERTZ
KM	KILOMETER
KV	KILOVOLT
KW	KILOWATT
KWH	KILOWATT HOUR

L

L	LENGTH OF ARC, TRAFFIC DETECTION LOOP
LAB	LABORATORY
LAT	LATERAL, LATITUDE
LBS	POUNDS
LF	LINEAL FOOT/FEET
LIM	LIMIT
LK	LAKE
LLV	LONG LEG VERTICAL
LONG	LONGITUDINAL, LONGITUDE
LP	LIGHT POLE, LAMP
LT	LEFT
LUMIN	LUMINAIRE
LWR	LOWER

M

M	METER
MA	TRAFFIC DETECTION MAGNETOMETER
MACH	MACHINE
MAINT	MAINTENANCE
MATL	MATERIAL
MAX	MAXIMUM
MB	MAILBOX
MC	MEANDER CORNER
MECH	MECHANICAL
MED	MEDIUM
MER	MERIDIAN
MFR	MANUFACTURE
MH	MANHOLE
MHHW	MEAN HIGHER HIGH WATER
MHT	MEAN HIGH TIDE
MHW	MEAN HIGH WATER
MIC	MONUMENT IN CASE
MID	MIDDLE
MIL	MILITARY
MIN	MINIMUM, MINUTE
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MK	MARK
ML	MATCH LINE
MLLW	MEAN LOWER LOW WATER
MLT	MEAN LOW TIDE
MLW	MEAN LOW WATER
MOD	MODIFICATION
M/L	MONUMENT LINE
MLCSP	MORTAR LINED AND COATED STEEL PIPE
MLTCS	MORTAR LINED TAPE COATED STEEL PIPE
MLECSP	MORTAR LINED EPOXY COATED STEEL PIPE
MON	MONUMENT
MPOC	MIDPOINT ON CURVE
MSNRY	MASONRY
MT	MEAN TIDE
MUTCD	MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

N

N	NORTH
NA	NOT APPLICABLE
NEG	NEGATIVE
NAUT	NAUTICAL
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOC
NEUT	NEUTRAL
NF	NEAR FACE
NIC	NOT IN CONTRACT
NOM	NOMINAL
NTS	NOT TO SCALE
NO	NUMBER

O

O	ORANGE
OB	ORANGE W/BLACK TRACER
O-XING	OVERHEAD CROSSING
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OFE	OWNER FURNISHED EQUIPMENT
OH	OVERHEAD
OHP	OVERHEAD POWER
OHW	ORDINARY HIGH WATER
OL	OVERLAP PHASE
OPNG	OPENING
OPP	OPPOSITE
OPR	OPERATE
OPT	OPTIC
OT	OVERHEAD TELEPHONE
OZ	OUNCE

P

P	POLE, POWER
PAR	PARALLEL
PC	POINT OF CURVATURE
PCC	PT OF COMPOUND CURVE
PD	PERFORATED DRAIN LINE
PE	PLAIN END
PED	PEDESTRIAN
PERM	PERMANENT
PERP	PERPENDICULAR
PH	PHASE
PI	POINT OF INTERSECTION
PKWY	PARKWAY
PL	PLASTIC, PLATE, PLACE
POA	POLE ORIENTATION ANGLE
POC	POINT ON CURVE
POS	POSITIVE, POSITION
PPB	PEDESTRIAN PUSH BUTTON
PPBP	PEDESTRIAN PUSH BUTTON POST
PR	PAIR
PRC	PT OF REVERSE CURVE
PROJ	PROJECT
PROP	PROPERTY
PRV	PRES REDUCING VALVE
PSI	POUNDS PER SQ. IN.
PT	POINT OF TANGENCY, PT
PUD	PUBLIC UTILITY DISTRICT NO.1 OF SNOHOMISH COUNTY
PV	POWER VAULT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PVT	POINT OF VERTICAL TANGENT
P/C	PRECAST
P/L	PROPERTY LINE
P/S	PRESTRESSED
P/T	POST-TENSIONED
PWR	POWER

Q

Q	QUADRUPOLE
QC	QUARTER CORNER
QT	QUART
QTR	QUARTER
QTY	QUANTITY
QUAD	QUADRANT, QUADRANGLE
QUAL	QUALITY

R

R	RADIUS, RED, RIVER
RA	RAISED
R-C	REBAR & CAP
RC	REINF CONC
RCKY	ROCKERY
RCP	REINF CONC PIPE
RB	RED W/ BLACK TRACER
RD	ROAD, ROUND
RECD	RECEIVED
RECT	RECTANGLE
REF	REFERENCE
REG	REGULAR
REINF	REINFORCED
REM	REMOVE, REMOVED
REPL	REPLACE, REPLACED
REQ	REQUIRED
RET	RETAINING
RETW	RETAINING WALL
RIV	RIVER
RLD	ROLLED
RMC	RIGID METAL CD
RPT	REPORT
RR	RAILROAD
RRCS	RR CROSSING SIG
RRG	RR CROSSING GATE
RRC	RR CROSSING
RT	RIGHT
R/W	RIGHT OF WAY

S

S	SOUTH, SLOPE
SAN	SANITARY
SB	SOIL BORING, SOUTH BOUND
SC	SECTION CORNER
SCb	SHIELDED CABLE
SCC	CLOSE CORNER
SCCP	STEEL CONCRETE CYLINDER PIPE
SCEM	CENTER OF SECTION
SCHED	SCHEDULE
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SE	SPOT EL/SOUTHEAST
SEC	SECOND
SECT	SECTION
SEG	SEGMENT
SEP	SEPARATE
SERV	SERVICE
SEW	SEWAGE
SHLD	SHIELDED
SHLDR	SHOULDER
SHT	SHEET
SIG	SIGNAL
SIM	SIMILAR
SL	SPAN LENGTH, SECTION LINE
S/L	SURVEY LINE
SLJB	STREET LIGHTING JB
SLP	SLOPE
SLS	STAINLESS STEEL
SLV	SLEEVE
SM	SMALL
SN	SIGN
SOV	SHUT-OFF VALVE
SP	SINGLE SHIELDED PAIR
SPA	SPACE, SPACES
SPC	SINGLE SHIELDED TWISTED PAIR CABLE
SPCb	PAIRS IN SINGLE CABLE
SPEC	SPECIFICATIONS
SR	STATE ROUTE
SQ	SQUARE
SS	SANITARY SEWER, STAINLESS STEEL
SSCO	SS CLEANOUT
SSMH	SS MANHOLE
ST	STREET
STA	STATION
STD	STANDARD
STIR	STIRRUP
STN, STL	STAINLESS STEEL
STPS	STEPS
STR	STREAM
STL	STEEL
SUB	SUBSTITUTE
SUR	SURFACE
SURV	SURVEY
SVL	SURVEY LINE
SW, S/W	SIDEWALK
SYM	SYMBOL, SYMMETRICAL
SYS	SYSTEM

T

T	TOP, TAN, TOPO
TB	THRUST BLOCK
TAN	TANGENT
T&B	TOP & BOTTOM
TBM	TEMP. BENCH MARK
TCb	BURIED TELEPHONE CABLE
TEBO	TELEPHONE BOOTH
TEL	TELEPHONE
TEMP	TEMPORARY
TESC	TEMP EROSION & SEDIMENTATION CONTROL
TJB	TELEPHONE JB
TK	THICKNESS
TMH	TELEPHONE MH
TOC	TOP OF CURB
TOE	CONCAVE SLOPE BREAK
TOP	CONVEX SLOPE BREAK
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB
TOW	TOP OF WALL
TP	TWISTED PAIRS, TEST PIT
TPOL	TRAFFIC SIGNAL POLE
TRAN	TRANSITION
TR	TRAFFIC, TELEPHONE RISER
TRJB	TRAFFIC SIGNAL JB
TS	TEST STATION
TSD	TRAFFIC SN DOUBLE POST
TSS	TRAFFIC SN SINGLE POST
TUN	TUNNEL
TV	TELEVISION
TWST	TWISTED
TYP	TYPICAL

U

UDS	UTILITY DUCT SYSTEM
UNGD	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
UG	UNDERGROUND
UP	UTILITY POLE
UPA	UTILITY POLE ANCHOR

V

V	VALVE
VAR	VARIES
VB	VALVE BOX, VAPOR BARRIER
VEH	VEHICLE
VERT	VERTICAL
VLT	VAULT
VP	VENT PIPE
VPC	VERTICAL CURVE PC
VPCC	VERTICAL CURVE PCC
VPI	VERTICAL CURVE PI
VPRC	VERTICAL CURVE PRC
VPT	VERTICAL CURVE PT

W

W	WEST, WATER LINE, WALK, & WHITE
W/	WITH
WB	WHITE W/BLACK TRACER
WC	WITNESS CORNER
WCR	WHEEL CHAIR RAMP
WFP	WATER FILTRATION PLANT
WGV	WATER GATE VALVE
WHSE	WAREHOUSE
WK	WALK
WM	WATER METER, WATERMAIN
W/O	WITHOUT
WO	WORK ORDER
WP	WORK POINT
WS	WATER SURFACE
WSDOT	WA DEPT OF TRANS
WT	WATTS, WEIGHT
WV	WATER VALVE
WW	WING WALL
WWM	WELDED WIRE MESH

X

X-BM	CROSS BEAM
X-RD	CROSS ROAD

Y

Y	YELLOW
YD	YARD

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

GENERAL

LEGEND, ABBREVIATIONS, AND DESIGNATIONS

G3

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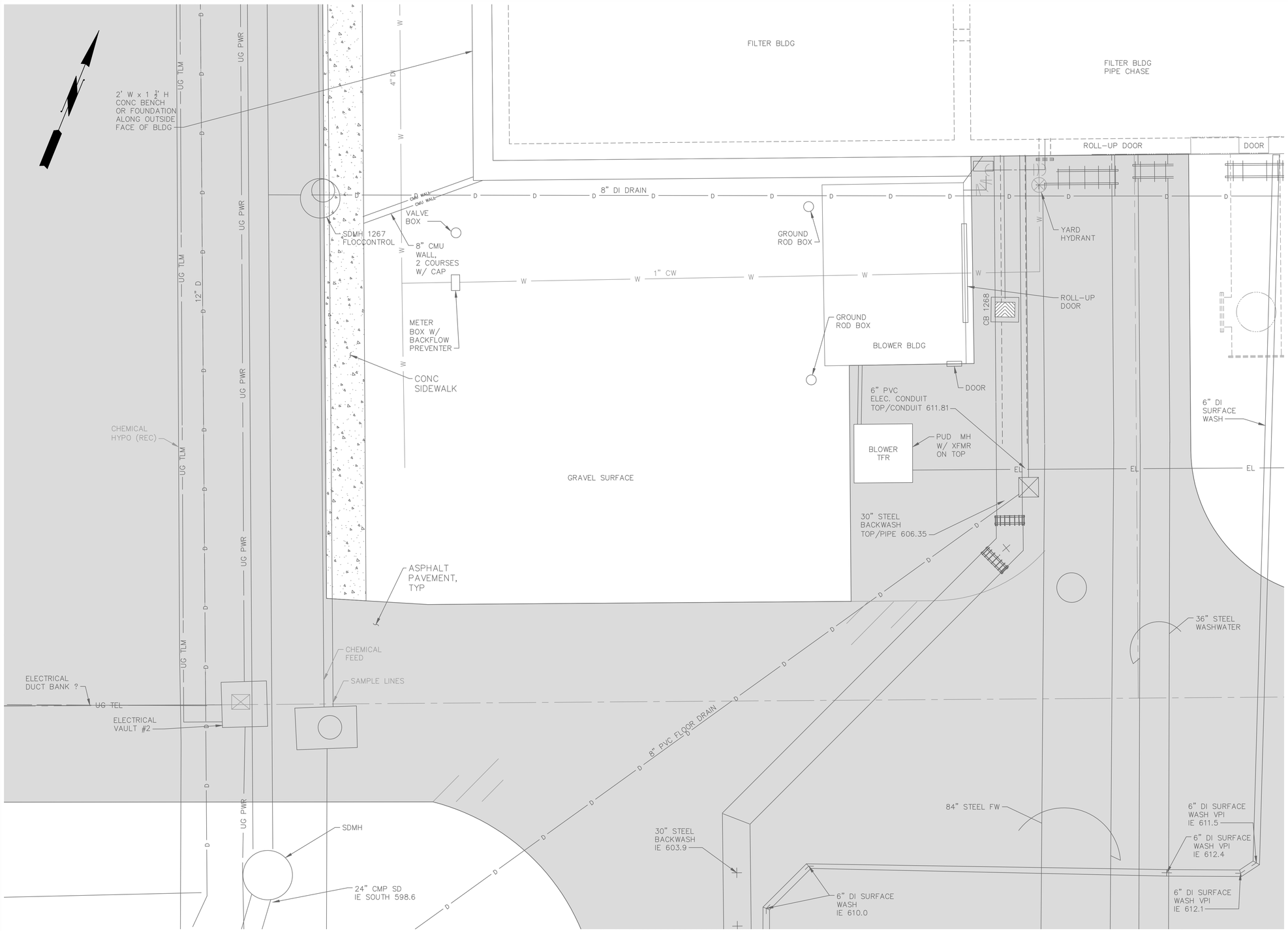
Plot date 5/30/2024 12:35 PM Plotted by Svetlana Olsoe Last saved by sbradley Plot style Everett.2016.stb Sheetset Name Everett Sheetset 2016
Filepath\Filename S:\CAD\EVERETT\23-10868 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_G3.DWG



NOTES:

1. THE CITY OF EVERETT AND BHC CONSULTANTS LLC ASSUME NO RESPONSIBILITY FOR EXISTING BURIED AND EXPOSED PIPING LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THESE DRAWINGS HAVE BEEN PLOTTED FROM AVAILABLE INFORMATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL PIPING PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO CONSTRUCTION. IF A CONFLICT EXISTS BETWEEN WHAT IS SHOWN ON THE DRAWINGS AND WHAT EXISTS IN THE FIELD, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE PROJECT MANAGER.

SCALE
10 5 0 10 20
FEET

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed Z. MILES, P.E.
Drawn J. LIRA
Checked R. DORN, P.E.
Design Review Level

JOHN T. GILLESPIE III — STATE OF WASHINGTON — 51993 — REGISTERED PROFESSIONAL ENGINEER — 6/1/2024

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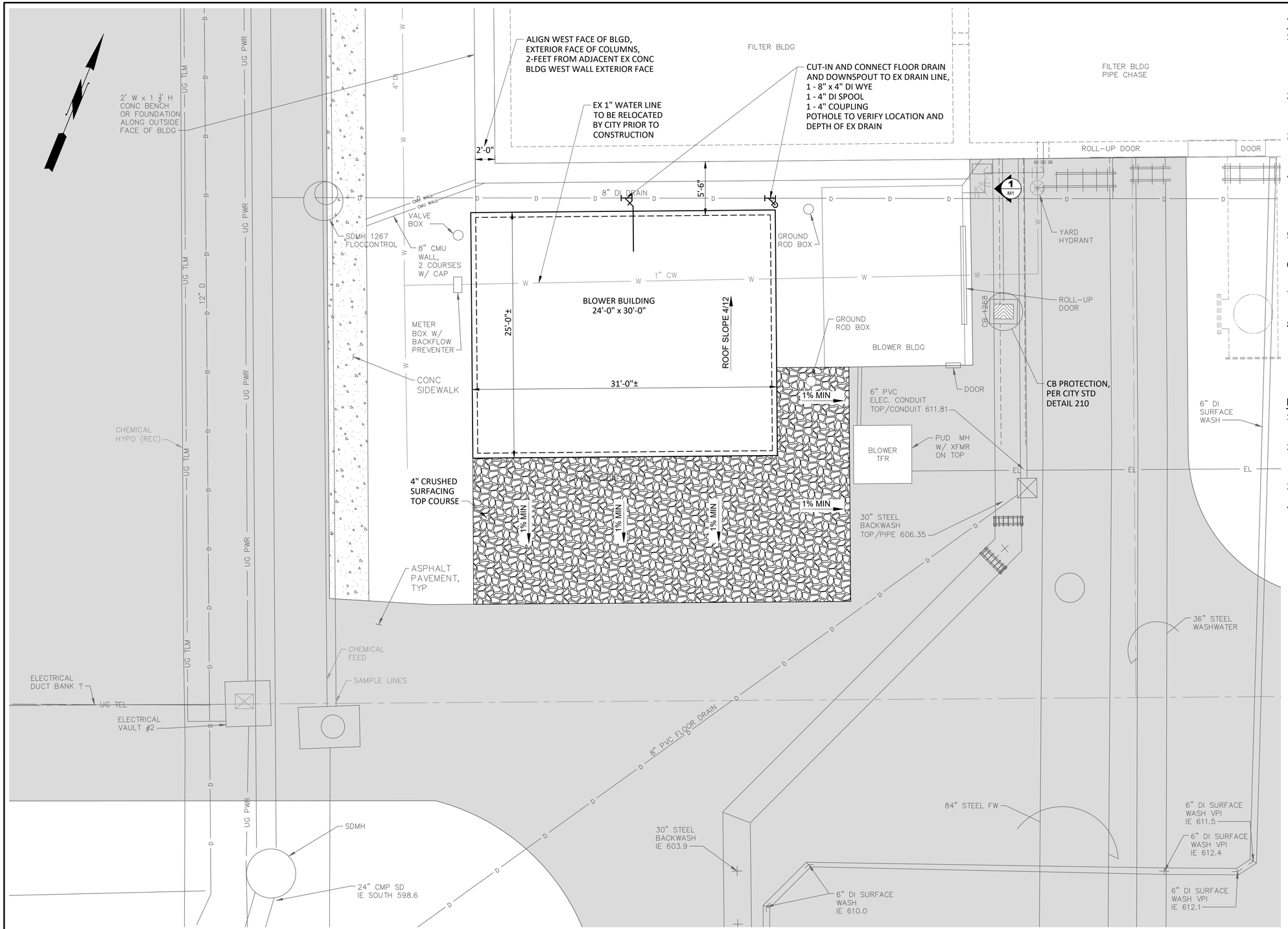
425.257.8800 everettwa.gov

WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

CIVIL

EXISTING CIVIL SITE PLAN

Drawing C1
Sheet No. 4 / 31 Of Total



TESC STANDARD NOTES:

1. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.
2. THE ESC FACILITIES SHALL BE INSPECTED ROUTINELY AND MAINTAINED BY THE APPLICANT/CONTRACTOR TO ENSURE THEIR CONTINUED FUNCTIONING, ESPECIALLY AFTER STORM EVENTS.
3. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 48 HOURS FOLLOWING MAJOR STORM EVENT.
4. AT NO TIME SHALL THE STORM DRAIN INLET PROTECTION UNIT BE GREATER THAN ONE THIRD FULL OF SEDIMENT. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO GRAVELING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT LADEN WATER INTO THE DOWNSTREAM SYSTEM.
5. ENSURE THAT ALL PAVED AREA ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
6. THE CONTRACTOR SHALL PROVIDE PERIODIC STREET CLEANING TO REMOVE DEBRIS AND SEDIMENT TRACKED OFF THE SITE.
7. APPROPRIATE MEASURES SHALL BE TAKEN TO STOP SEDIMENT FROM ENTERING SURFACE WATER BODIES IF THE PROPOSED BMPS FAIL.
8. BARE AND/OR DISTURBED SOILS SHALL REMAIN UNCOVERED AND/OR UNSTABILIZED FOR NO MORE THAN 2 DAYS FROM OCTOBER 1 THROUGH APRIL 30, AND FOR NO MORE THAN 7 DAYS FROM MAY 1 THROUGH SEPTEMBER 30.

NOTES:

1. SURFACE RESTORATION TO MATCH EXISTING (CRUSHED ROCK OR ASPHALT PAVEMENT), EXCEPT WHERE NOTED ON THE PLANS.
2. MAINTAIN MINIMUM 1% SLOPE ON NEW CRUSHED SURFACING TOP COURSE FROM EDGE OF NEW BUILDING TO EXISTING ASPHALT PAVEMENT.
3. SEE DWG M1 FOR PHOTO 1.
4. INSTALL NEW DRAIN WITH MINIMUM 2% SLOPE. DRAIN TRENCH SHALL BE PER CITY STD DETAIL 614.

SCALE
10 5 0 10 20
FEET

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Designed Z. MILES, P.E.
Drawn J. LIRA
Checked J. GILLESPIE, P.E.
Design Review Level

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6/11/2024

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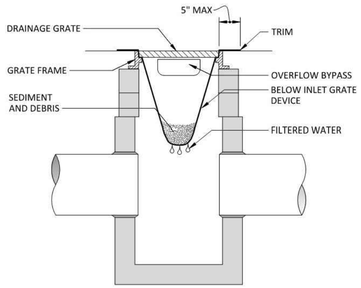
WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

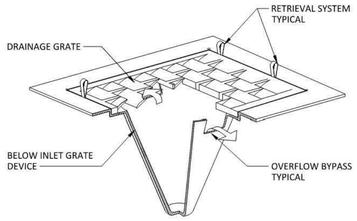
CIVIL

CIVIL SITE AND TESC PLAN

Drawing C2
Sheet No. 5 / 31 Of Total



SECTION VIEW



ISOMETRIC VIEW

NOTES

1. CATCH BASIN INSERTS SHALL BE REMOVED AT THE END OF THE PROJECT.
2. CATCH BASIN INSERTS ARE ONLY TO BE INSTALLED IN DRAINAGE DEVICES PER THE MANUFACTURES'S RECOMMENDATIONS. CATCH BASIN INLET INSERTS SHALL BE INSTALLED IN CURB INLETS.
3. CATCH BASIN INSERTS SHALL BE INSTALLED PRIOR TO CLEARING AND GRADING ACTIVITY, OR UPON PLACEMENT OF A NEW CATCH BASIN.
4. SEDIMENT SHALL BE REMOVED FROM THE UNIT WHEN IT BECOMES ONE THIRD FULL OR IN ACCORDANCE WITH THE MANUFACTURES' INSTRUCTIONS.
5. SEDIMENT REMOVAL SHALL BE ACCOMPLISHED BY REMOVING THE INLET INSERTS, EMPTYING, AND RE-INSTALLING IT INTO THE CATCH BASIN. DO NOT WASH SEDIMENT INTO STORM DRAINS WHILE CLEANING.
6. SIZE THE BELOW INLET GRATE DEVICE (BIGD) FOR THE STORM WATER STRUCTURE IT WILL SERVICE.
7. THE BIGD SHALL HAVE A BUILT-IN HIGH-FLOW RELIEF SYSTEM (OVERFLOW BYPASS).
8. THE RETRIEVAL SYSTEM MUST ALLOW REMOVAL OF THE BIGD WITHOUT SPILLING THE COLLECTED MATERIAL.
9. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.3(15).

WSDOT STD PLAN I-40.20-00 ACCEPTABLE SUBSTITUTE IF MAINTENANCE MEETS NOTES 1-5

CITY OF EVERETT
PUBLIC WORKS DEPARTMENT

City Engineer	Engineering Manager	CAD Manager	Drawn By	Current Rev Date
RYAN SASS	HEATHER GRIFFIN	PAUL WILHELM	TSH	12/30/2016

Title: STORM DRAIN INLET PROTECTION

STANDARD DRAWING No.: 210

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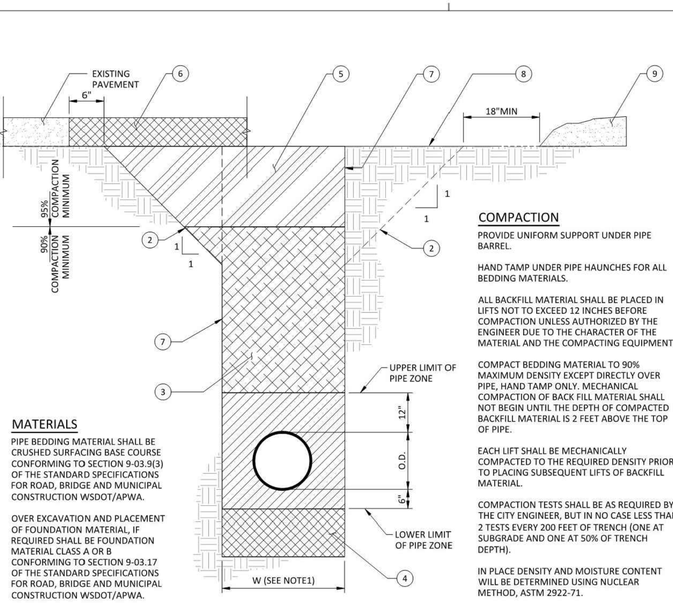

MATERIALS

PIPE BEDDING MATERIAL SHALL BE CRUSHED SURFACING BASE COURSE CONFORMING TO SECTION 9-03.9(3) OF THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION WSDOT/APWA.

OVER EXCAVATION AND PLACEMENT OF FOUNDATION MATERIAL, IF REQUIRED SHALL BE FOUNDATION MATERIAL CLASS A OR B CONFORMING TO SECTION 9-03.17 OF THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION WSDOT/APWA.

COMPACTION

PROVIDE UNIFORM SUPPORT UNDER PIPE BARREL.

HAND TAMP UNDER PIPE HAUNCHES FOR ALL BEDDING MATERIALS.

ALL BACKFILL MATERIAL SHALL BE PLACED IN LIFTS NOT TO EXCEED 12 INCHES BEFORE COMPACTION UNLESS AUTHORIZED BY THE ENGINEER DUE TO THE CHARACTER OF THE MATERIAL AND THE COMPACTING EQUIPMENT.

COMPACT BEDDING MATERIAL TO 90% MAXIMUM DENSITY EXCEPT DIRECTLY OVER PIPE, HAND TAMP ONLY. MECHANICAL COMPACTION OF BACK FILL MATERIAL SHALL NOT BEGIN UNTIL THE DEPTH OF COMPACTED BACKFILL MATERIAL IS 2 FEET ABOVE THE TOP OF PIPE.

EACH LIFT SHALL BE MECHANICALLY COMPACTED TO THE REQUIRED DENSITY PRIOR TO PLACING SUBSEQUENT LIFTS OF BACKFILL MATERIAL.

COMPACTION TESTS SHALL BE AS REQUIRED BY THE CITY ENGINEER, BUT IN NO CASE LESS THAN 2 TESTS EVERY 200 FEET OF TRENCH (ONE AT SUBGRADE AND ONE AT 50% OF TRENCH DEPTH).

IN PLACE DENSITY AND MOISTURE CONTENT WILL BE DETERMINED USING NUCLEAR METHOD, ASTM 2922-71.

LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT WILL BE DETERMINED USING THE MODIFIED PROCTOR METHOD IN ACCORDANCE WITH ASTM D-1557.

NOTES

1. W = MAXIMUM WIDTH OF TRENCH. FOR PIPES 15" OR LESS IN DIA W=40". FOR PIPES 18" OR GREATER W=1.5 X I.D. + 18". PIPE MUST BE CENTERED IN TRENCH.
2. ALTERNATE SLOPING TRENCH WALL TO MEET O.S.H.A. REQUIREMENTS (NO SLOPES STEEPER THAN 1:1 EXCEPT FOR ROCK).
3. SUITABLE NATIVE MATERIAL OR IMPORTED GRAVEL BORROW AS DIRECTED. COMPACT TO 90% MAXIMUM DENSITY.
4. FOUNDATION GRAVEL IF REQUIRED BY THE ENGINEER TO REPLACE UNSUITABLE MATERIAL. SHALL BE FOUNDATION MATERIAL CLASS A, B OR AS APPROVED BY THE ENGINEER.
5. IF DIRECTED BY THE ENGINEER THE TOP THREE TO FIVE FEET OF BACKFILL SHALL BE IMPORTED GRAVEL BORROW OR SUITABLE NATIVE MATERIAL COMPACTED TO 95% MAXIMUM DENSITY.
6. SEE CITY OF EVERETT STANDARD DWG 326 FOR PAVEMENT PATCH DETAILS.
7. VERTICAL TRENCH WALLS WITH SHORING TO CONFORM TO O.S.H.A. REGULATIONS.
8. SUBGRADE OR GROUND SURFACE IN NON-PAVED AREAS.
9. EXCAVATED NATIVE MATERIAL OR STOCKPILED BACKFILL MATERIAL.
10. FOR ALL TRENCHING TRANSVERSE TO THE ROADWAY BACKFILL ABOVE THE PIPE ZONE SHALL BE CONTROLLED DENSITY FILL. SEE SECTION 3-9.6 & 3-20.1 OF THESE STANDARDS.
11. FOR UTILITY CUTS SUCH AS GAS, TELEPHONE, POWER, AND CABLE TV LONGITUDINAL TO THE ROADWAY, BACKFILL SHALL BE CONTROLLED DENSITY FILL. SEE SECTION 3-9.5 OF THESE STANDARDS.

EVERETT WASHINGTON **PUBLIC WORKS DEPARTMENT**

City Engineer	Engineering Manager	CAD Manager	Drawn By	Current Rev Date
RYAN SASS	DAVID VONG	PAUL WILHELM	TSH	12/11/2019

Title: TYPICAL TRENCH SECTION

STANDARD DRAWING No.: 614

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NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed: Z. MILES, P.E.
Drawn: J. LIRA
Checked: J. GILLESPIE, P.E.
Design Review Level

HOLLY F. GILLESPIE III — STATE OF WASHINGTON — 21993 — REGISTERED PROFESSIONAL ENGINEER — 6/1/2024

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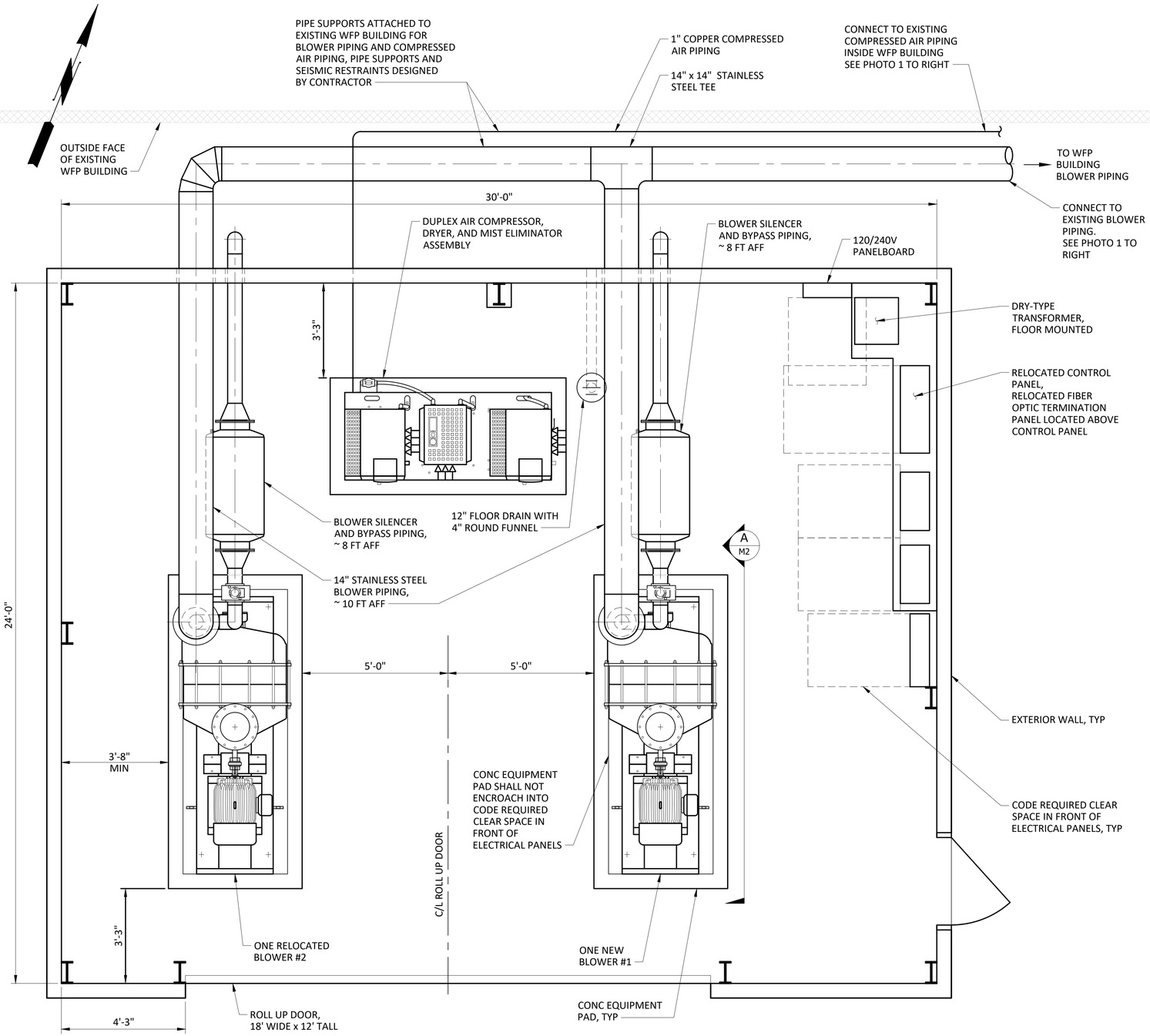
WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

CIVIL

CIVIL DETAILS

C3

6 / 31



1 / - MECHANICAL PLAN
SCALE: 1/2" = 1'-0"

NOTES:

1. PIPE AND EQUIPMENT SUPPORTS AND SEISMIC RESTRAINTS SHALL BE DESIGNED BY CONTRACTOR.
2. BLOWER INLET AND OUTLET FLANGES HAVE FORCE AND TORQUE LIMITIATIONS. REFER TO MANUFACTURER SPECIFICATIONS FOR DETAILS.
3. CONTRACTOR SHALL COORDINATE OUTAGE OF COMPRESSED AIR SYSTEM WITH OWNER AT LEAST 14 DAYS IN ADVANCE. CONTRACTOR WILL BE LIMITED TO 1 HOUR TO DEPRESSURIZE THE SYSTEM, MAKE THE CONNECTION, TEST THE SYSTEM, AND RESTORE THE SYSTEM.

1 / C2 PHOTO
SCALE: N.T.S.

SCALE
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FEET

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ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed: Z. MILES, P.E.
Drawn: A. Bradley
Checked: R. DORN, P.E.
Design Review Level

ZACHARY JOSEPH MILES — STATE OF WASHINGTON — 22036227 — REGISTERED PROFESSIONAL ENGINEER — 6/1/2024

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

MECHANICAL

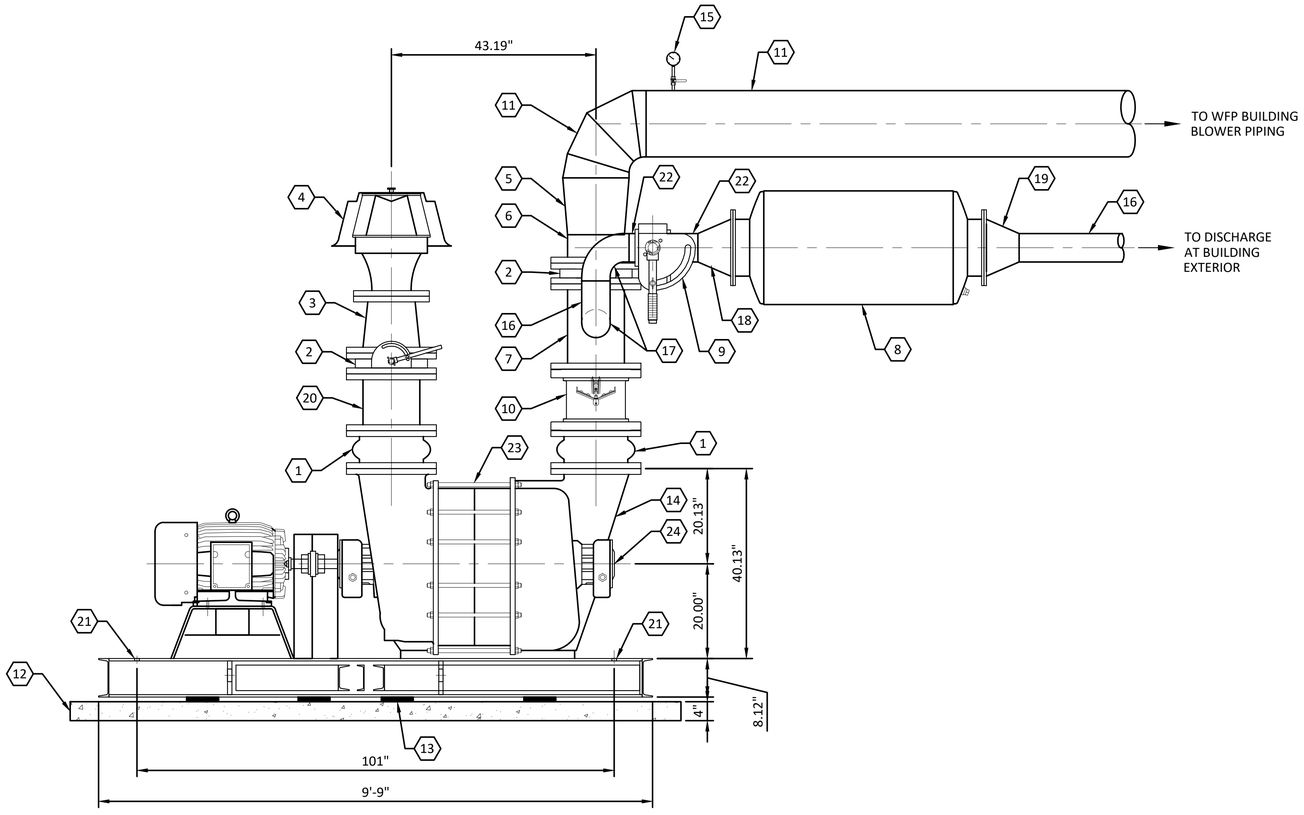
MECHANICAL PLAN

Drawing: M1
Sheet No.: 7
Of Total: 31

Plot date 5/31/2024 1:58 PM Plotted by: Anthony Bradley Last saved by: abradley Plot style: Everett-2016.stb Sheetset Name: Everett Sheetset 2016
File path\Filename: S:\CAD\EVERETT\23-10858 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\13813_M1.DWG

NOTES:

1. BLOWER ELEVATION DEPECITED IS FOR NEW BLOWER. FIELD VERIFY DIMENSIONS AND ADJUST AS NECESSARY.
2. PIPE AND EQUIPMENT SUPPORTS AND SEISMIC RESTRAINTS SHALL BE DESIGNED BY CONTRACTOR.
3. BLOWER INLET AND OUTLET FLANGES HAVE FORCE AND TORQUE LIMITIATIONS. REFER TO MANUFACTURER SPECIFICATIONS FOR DETAILS.



A / M1 BLOWER ELEVATION

SCALE: 3/4" = 1'-0"

SCALE
10 5 0 10 20
FEET

EXISTING BLOWER MATERIAL LIST

1. 12" EXPANSION JOINT, FL x FL
2. 12" BUTTERFLY VALVE W/ LEVER ACTUATOR, FL x FL
3. 12" x 10" STAINLESS STEEL REDUCER, FL x FL
4. 10" BLOWER INTAKE FILTER SILENCER, FL
5. 12" x 14" STAINLESS STEEL INCREASER, WLD x WLD
6. 12" STAINLESS STEEL SPOOL, FL x WLD
7. 12" STAINLESS STEEL PIPE W/ 6" OUTLET, FL x FL
8. 12" BLOWER DISCHARGE SILENCER, FL x FL
9. 6" BUTTERFLY VALVE W/ LEVER ACTUATOR, FL x FL
10. 12" CHECK VALVE, FL x FL
11. 14" STAINLESS STEEL PIPING, WLD x WLD
12. CONCRETE EQUIPMENT PAD
13. VIBRATION PADS, OFE (8)
14. MULTISTAGE CENTRIFUGAL AIR BLOWER, OFE
15. PRESSURE GAUGE, 1/2" NPT, INSTALLED ON SIDE OF BLOWER PIPING SO IT CAN BE VIEWED FROM THE FLOOR
16. 6" STAINLESS STEEL SPOOL, WLD x WLD
17. 6" STAINLESS STEEL 90° BEND, WLD X WLD
18. 6" x 12" STAINLESS STEEL INCREASER, WLD x FL
19. 12"x 6" STAINLESS STEEL REDUCER, FL x WLD
20. 12" STAINLESS STEEL SPOOL, FL x FL
21. 3/4" Ø ANCHOR ROD WITH 8" EMBEDMENT AND 8" CLEARANCE FROM EDGE OF EQUIPMENT PAD
22. 6" STAINLESS STEEL SPOOL, WLD x FL
23. BLOWER VIBRATION SENSOR, OFE (2)
24. BLOWER BEARING RTD, OFE (2)

NEW BLOWER MATERIAL LIST

1. 12" EXPANSION JOINT, FL x FL, OFE (1 OF 2)
2. 12" BUTTERFLY VALVE W/ LEVER ACTUATOR, FL x FL, OFE
3. 12" x 10" STAINLESS STEEL REDUCER, FL x FL
4. 10" BLOWER INTAKE FILTER SILENCER, FL, OFE
5. 12" x 14" STAINLESS STEEL INCREASER, WLD x WLD
6. 12" STAINLESS STEEL SPOOL, FL x WLD
7. 12" STAINLESS STEEL PIPE W/ 6" OUTLET, FL x FL
8. 12" BLOWER DISCHARGE SILENCER, FL x FL
9. 6" BUTTERFLY VALVE W/ LEVER ACTUATOR, FL x FL
10. 12" CHECK VALVE, FL x FL, OFE
11. 14" STAINLESS STEEL PIPING, WLD x WLD
12. CONCRETE EQUIPMENT PAD
13. VIBRATION PADS, OFE (8)
14. MULTISTAGE CENTRIFUGAL AIR BLOWER, OFE
15. PRESSURE GAUGE, 1/2" NPT, OFE, INSTALLED ON SIDE OF BLOWER PIPING SO IT CAN BE VIEWED FROM THE FLOOR
16. 6" STAINLESS STEEL SPOOL, WLD x WLD
17. 6" STAINLESS STEEL 90° BEND, WLD X WLD
18. 6" x 12" STAINLESS STEEL INCREASER, WLD x FL
19. 12"x 6" STAINLESS STEEL REDUCER, FL x WLD
20. 12" STAINLESS STEEL SPOOL, FL x FL
21. 3/4" Ø ANCHOR ROD WITH 8" EMBEDMENT AND 8" CLEARANCE FROM EDGE OF EQUIPMENT PAD
22. 6" STAINLESS STEEL SPOOL, WLD x FL
23. BLOWER VIBRATION SENSOR, OFE (2)
24. BLOWER BEARING RTD, OFE (2)

NO.	DATE	APRVD	REVISION

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ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed Z. MILES, P.E.
Drawn A. BRADLEY
Checked R. DORN, P.E.
Design Review Level

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6/1/2024

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

MECHANICAL

MECHANICAL ELEVATION

Drawing M2
Sheet No. 8 / 31 Of Total

Plot date 5/31/2024 1:56 PM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
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ARCHITECTURAL GENERAL NOTES

1. DRAWINGS ARE IN PART DIAGRAMMATIC AND DO NOT NECESSARILY SHOW COMPLETE DETAILS OF CONSTRUCTION, WORK, OR MATERIALS, PERFORMANCE OR INSTALLATION. DRAWINGS DO NOT NECESSARILY SHOW HOW CONSTRUCTION DETAILS, OTHER ITEMS OR WORK AND EQUIPMENT MAY AFFECT A PARTICULAR INSTALLATION.
2. FEATURES NOT FULLY SHOWN ON PLANS OR DETAILS ARE TO BE PROVIDED AS INDICATED FOR SIMILAR CONDITIONS.
3. THE OWNER SHALL BE NOTIFIED OF ANY VARIATION FROM THE DIMENSIONS AND/OR CONDITIONS SHOWN ON THESE DOCUMENTS, ANY SUCH VARIATIONS SHALL BE APPROVED BY THE OWNER PRIOR TO PROCEEDING WITH THE WORK, OR THE CONTRACTOR SHALL ACCEPT FULL RESPONSIBILITY FOR COST TO RECTIFY THE SAME.
4. ALL DIMENSIONS TO WALLS SHOWN ON DRAWINGS ARE TAKEN FROM FACE OF BLOCK.
5. DO NOT SCALE DRAWINGS. WRITTEN DIMENSIONS ON THE DRAWINGS SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS.
6. VERIFY DIMENSIONS, ROUGH OPENING SIZES SHOWN FOR DOORS, WINDOWS AND OTHER PENETRATIONS AGAINST REQUIREMENTS OF SPECIFIED PRODUCTS, CONDITIONS, ELEVATIONS, ETC. PERTAINING TO WORK BEFORE PROCEEDING.
7. PROVIDE ALL SUB-FRAMING AS REQUIRED TO RECEIVE WORK BY OTHERS.
8. PROVIDE GALVANIC ISOLATION BETWEEN DISSIMILAR METALS.
9. ALL OPENINGS SHALL BE CAULKED, SEALED, OR WEATHER STRIPPED.
10. NOT ALL ELEMENTS ARE SHOWN ON ARCHITECTURAL DRAWINGS. SEE STRUCTURAL, MECHANICAL AND ELECTRICAL DRAWINGS.
11. ALL CLEAR DIMENSIONS ARE TO BE EXACTLY WITHIN 1/8" FULL HEIGHT AND WIDTH OF WALLS. CONTRACTOR SHALL NOT ADJUST ANY DIMENSIONS MARKED "CLEAR" OR "CLR" WITHOUT WRITTEN INSTRUCTIONS FROM THE OWNER.
12. CONTRACTOR SHALL ADHERE TO ALL CODES, RULES AND REGULATIONS GOVERNING CONSTRUCTION BUILDING ACCESS AND THE USE OF FACILITIES AS SET BY THE AUTHORITY HAVING JURISDICTION.

CODE NOTES

JURISDICTION:	CITY OF EVERETT PERMIT SERVICES
BUILDING:	2021 INTERNATIONAL BUILDING CODE (IBC), WITH CITY OF EVERETT AMENDMENTS
FIRE PROTECTION:	2021 INTERNATIONAL FIRE CODE (IFC), WITH WASHINGTON STATE AMENDMENTS
	HYDRANTS, FIRE EXTINGUISHERS, COMBUSTIBLE GAS DETECTION SYSTEM PER NFPA 820, 2016 EDITION
ACCESSIBILITY:	2021 IBC CH. 11 WITH WASHINGTON STATE WAC 51-50 AMENDMENTS AND ICC A117.1-2009
ENERGY:	2021 WASHINGTON STATE ENERGY CODE

BLOWER BUILDING

BUILDING TYPE:	V-B
OCCUPANCY TYPE:	U (2021 IBC 312)
OCCUPANT LOAD:	49 (2021 IBC TABLE 1006.2.1)
FIRE SPRINKLERS:	REQUIRED: NO (2021 IBC 903.2)
	PROVIDED: NO
FIRE ALARM:	REQUIRED: NO (2021 IBC 907.2.2)
	PROVIDED: NO

BUILDING HEIGHT (2021 IBC TABLE 504.3, 504.4)

A. ALLOWABLE: 1 STORIES/40 FT
B. PROPOSED : 1 STORY/ 12 FT (FROM FINISH GRADE)

BUILDING AREA (2021 IBC TABLE 506.2)

A. ALLOWABLE: 5,500 SF
B. PROPOSED : BLOWER BUILDING (750 SF)

EXITING

EXIT ACCESS TRAVEL DISTANCE:
LESS THAN 300 FT OF TRAVEL DISTANCE
(2021 IBC TABLE 1017.2)

COMMON PATH EGRESS TRAVEL:
LESS THAN 100 FT
(2021 IBC TABLE 1006.2.1)

MIN NUMBER OF EXIT OR EXIST ACCESS PER ROOM:
1 (2021 IBC 1006.3.1)

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BID			CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD
	06-2024	JFG						

Designed Z. MILES, P.E.
Drawn A. BRADLEY
Checked R. DORN, P.E.
Design Review Level

KENNETH F. DAHL — STATE OF WASHINGTON — 23041 — PROFESSIONAL ENGINEER — 6/1/2024

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ARCHITECTURAL

CODE SUMMARY

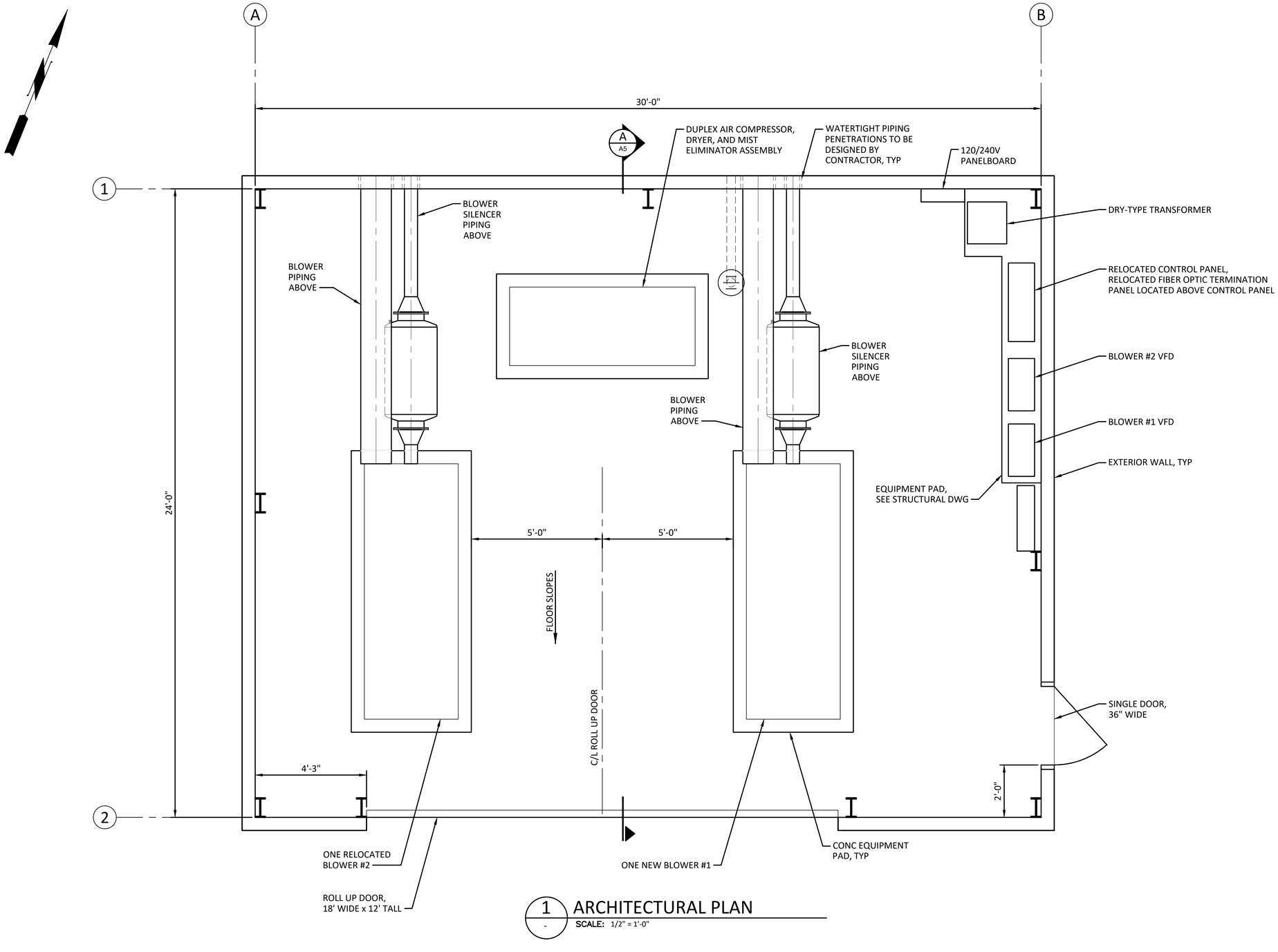
Drawing A1

Sheet No. 9 / 31 Of Total

Plot date 5/30/2024 12:25 PM Plotted by Svetlana Olson Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
File path\Filename S:\CAD\EVERETT\23-10888 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_A1.DWG

NOTES:

1. 6" MINIMUM DISTANCE FROM EQUIPMENT EDGE TO OUTSIDE OF EQUIPMENT PAD.



1 - ARCHITECTURAL PLAN

SCALE: 1/2" = 1'-0"

NO.	DATE	APRVD	REVISION
			PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed Z. MILES, P.E.
Drawn A. BRADELY
Checked R. DORN, P.E.
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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ARCHITECTURAL

ARCHITECTURAL PLAN

Drawing A2

Sheet No. 10 / 31 Of Total

Plot date 5/30/2024 4:48 PM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
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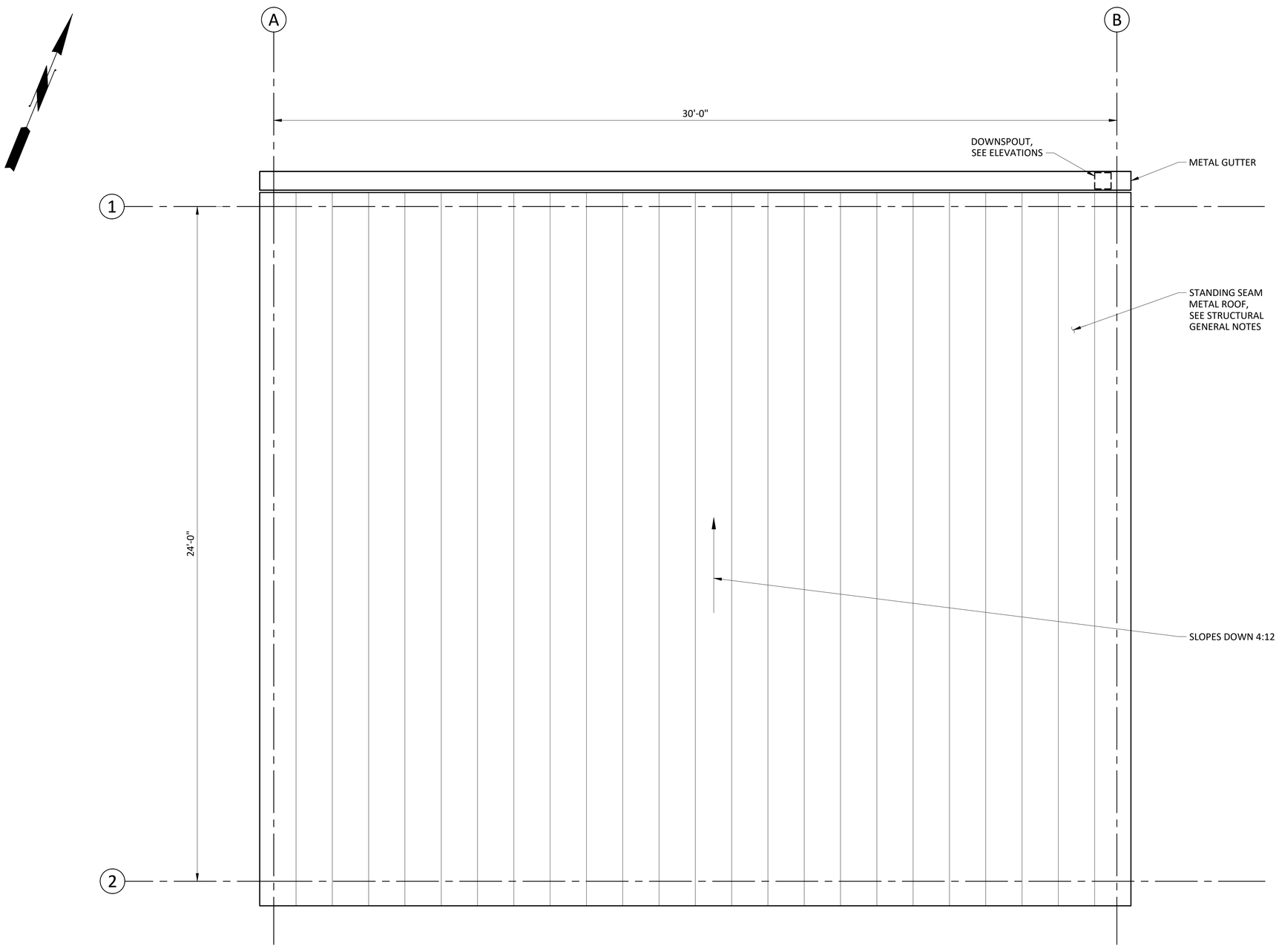

1 ROOF PLAN
SCALE: 1/2" = 1'-0"

NOTES:

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Designed: Z. MILES, P.E.
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WFP AIR SCOUR BLOWER
BUILDING REPLACEMENT

ARCHITECTURAL

ROOF PLAN

Drawing: A3
Sheet No.: 11
Of Total: 31

Plot date 5/30/2024 12:57 PM Plotted by Svetlana Olice Last saved by abradley Plot style Everett 2016.stb Sheetset Name Everett Sheetset 2016
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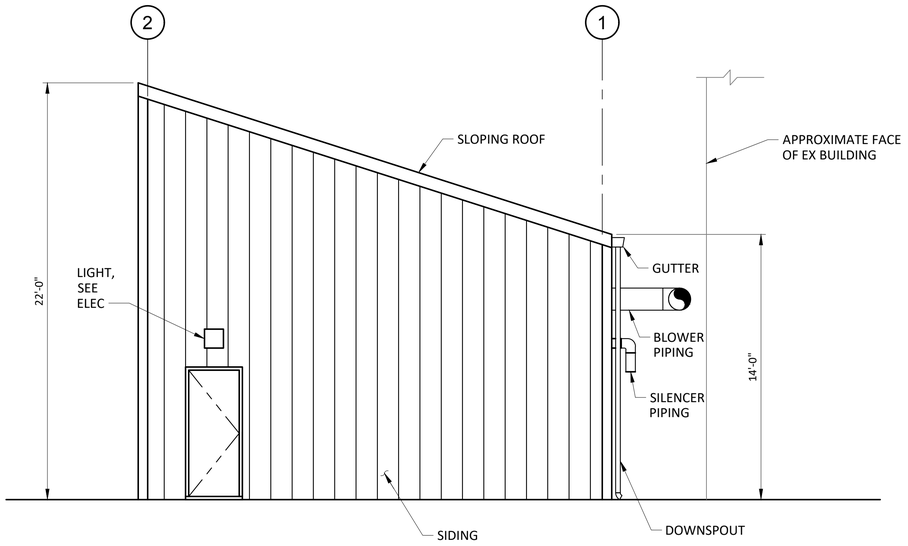
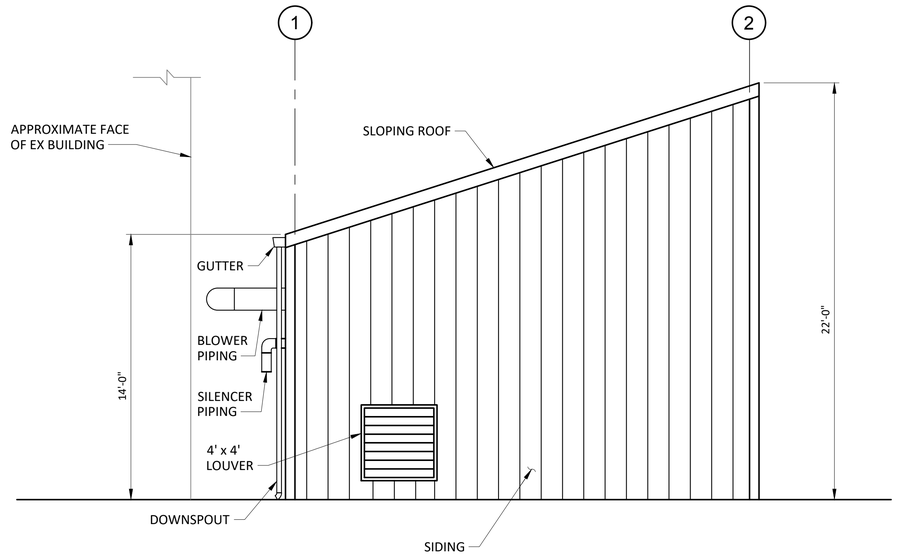
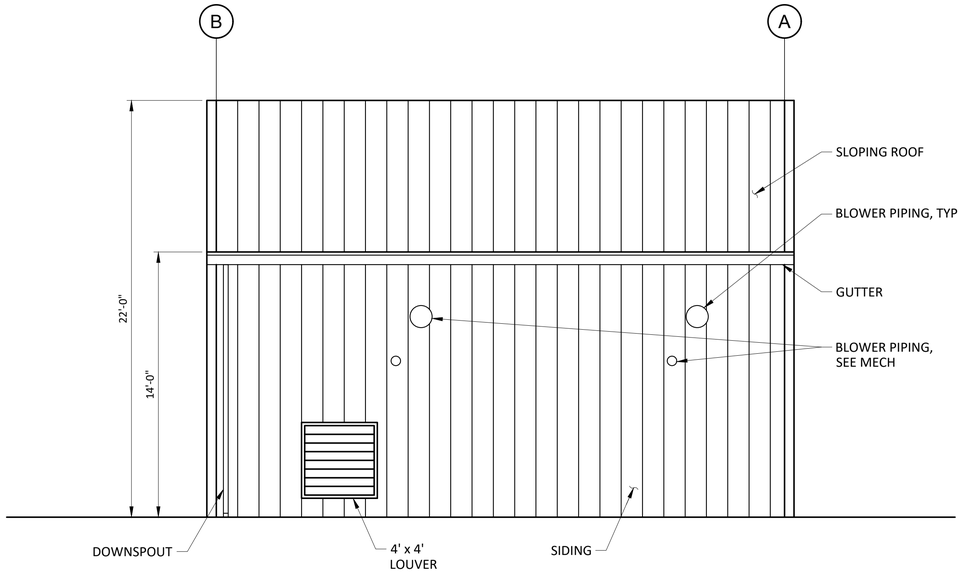


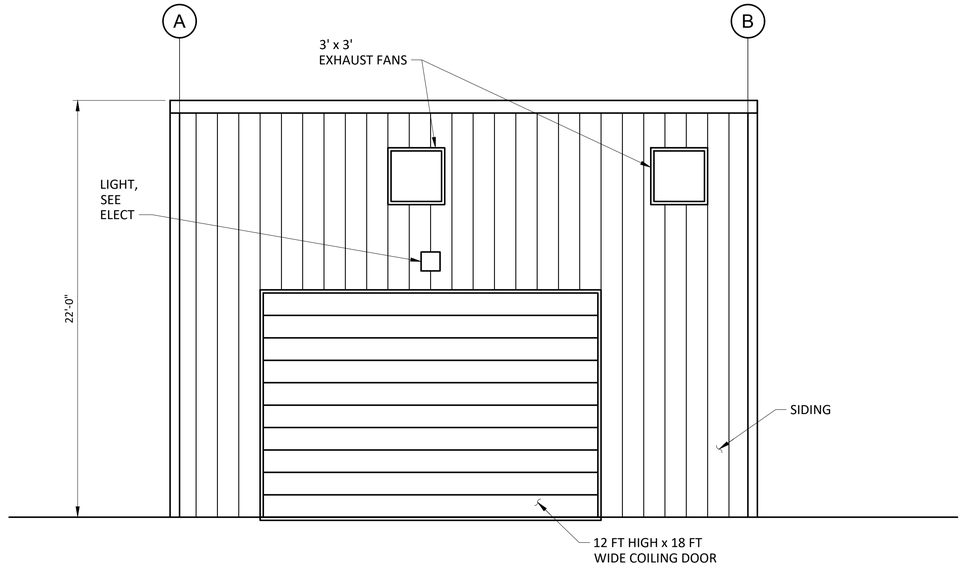
1 C2 EAST ELEVATION
SCALE: 1/4" = 1'-0"



2 C2 WEST ELEVATION
SCALE: 1/4" = 1'-0"



3 C2 NORTH ELEVATION
SCALE: 1/4" = 1'-0"



4 C2 SOUTH ELEVATION
SCALE: 1/4" = 1'-0"

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Designed Z. MILES, P.E.
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WFP AIR SCOUR BLOWER
BUILDING REPLACEMENT

ARCHITECTURAL

BUILDING EXTERIOR ELEVATIONS

Drawing A4
Sheet No. 12
31 Of Total

Plot date 5/30/2024 1:00 PM Plotted by Svetlana Olsoe Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
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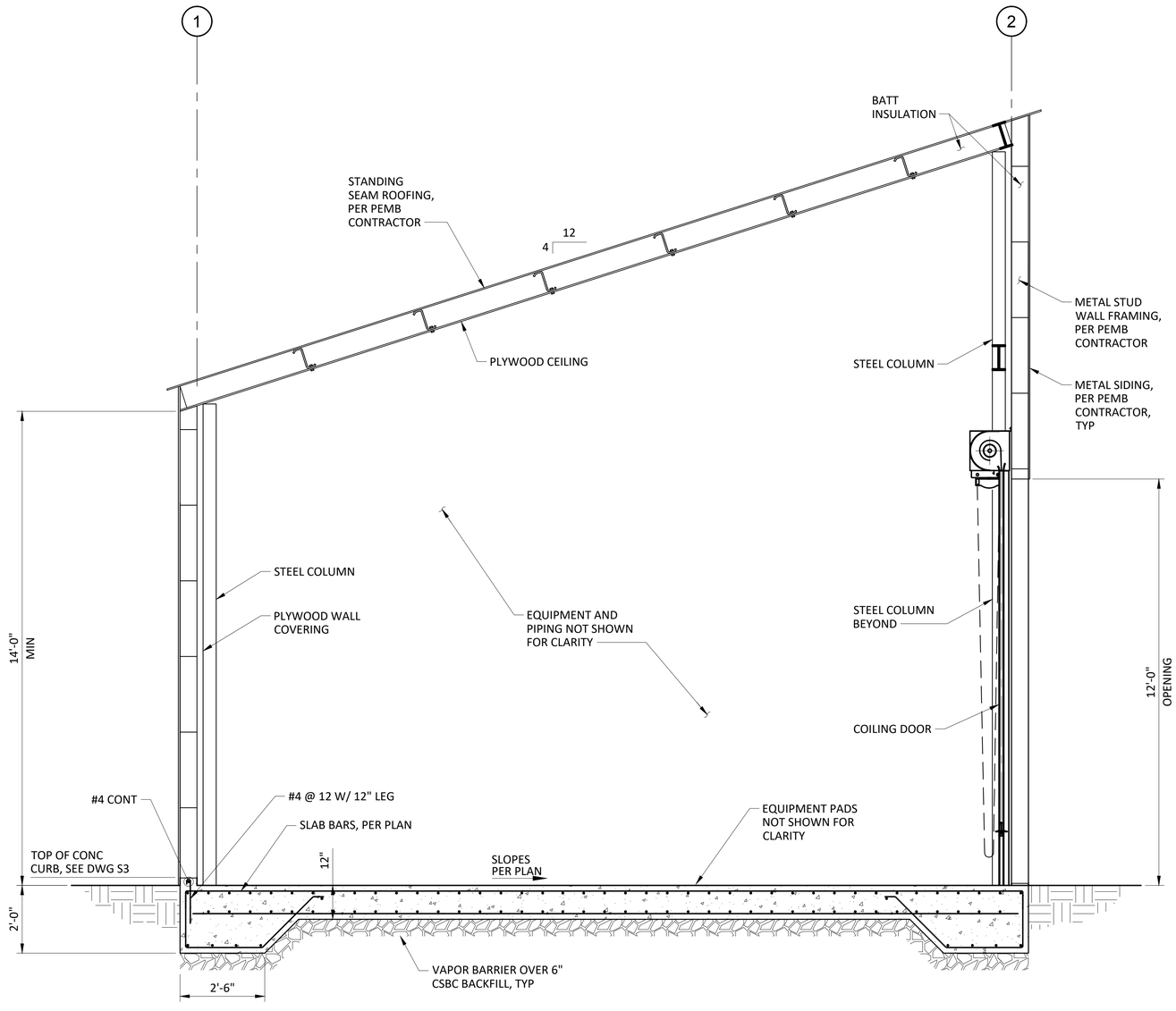

A / A2 SECTION

SCALE: 1/2" = 1'-0"

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Designed Z. MILES, P.E.
Drawn A. BRADLEY
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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ARCHITECTURAL

BUILDING SECTION

Drawing A5

Sheet No. 13 / 31 Of Total

Plot date 5/30/2024 3:55 PM Plotted by Svetlana Olsse Last saved by solsse Plot style Everett 2016.ctb Sheetset Name Everett Sheetset 2016
File path\Filename S:\CAD\EVERETT\23-10858 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_A5.DWG

GENERAL STRUCTURAL NOTES

A. GENERAL

1. SCOPE
   THE GENERAL STRUCTURAL NOTES AND TYPICAL STRUCTURAL DETAILS ARE GENERAL AND APPLY TO TO THE ENTIRE PROJECT EXCEPT WHERE THERE ARE SPECIFIC INDICATIONS OR MODIFICATIONS TO THE CONTRARY.

2. APPLICABLE SPECIFICATIONS AND CODES
   ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE BUILDING CODE, (SEE BELOW). THE PROVISIONS OF THE BUILDING CODE SHALL SUPERSEDE THE PLANS AND SPECIFICATIONS EXCEPT WHERE THE PLANS AND SPECIFICATIONS ARE MORE RESTRICTIVE.

   IN ADDITION TO THE BUILDING CODE, CONSTRUCTION SHALL CONFORM TO OTHER STANDARDS AND CODES AS REFERENCED ON THE DRAWINGS OR IN THE SPECIFICATIONS.

3. DIMENSIONS
   STRUCTURAL DIMENSIONS CONTROLLED BY OR RELATED TO MECHANICAL AND ELECTRICAL EQUIPMENT SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

   REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR SIZE AND LOCATION OF ALL OPENINGS FOR DUCTS, PIPING, CONDUITS, ETC., NOT SHOWN. ALL OPENINGS IN STRUCTURAL MEMBERS SHALL BE APPROVED BY THE STRUCTURAL ENGINEER. REFER TO CIVIL DRAWINGS AND SPECIFICATIONS FOR SUBGRADE INFORMATION AND CRITERIA. VERIFY ALL DIMENSIONS WITH CIVIL, MECHANICAL, AND ELECTRICAL DRAWINGS.

4. PROVISIONS FOR EQUIPMENT
   MECHANICAL AND ELECTRICAL EQUIPMENT SUPPORTS, ANCHORAGES, OPENINGS, PIPE SLEEVES AND, PENETRATIONS, RECESSES AND REVEALS NOT SHOWN ON THE STRUCTURAL DRAWINGS, BUT REQUIRED BY OTHER CONTRACT DRAWINGS SHALL BE PROVIDED FOR, PRIOR TO CASTING CONCRETE.

5. CONSTRUCTION LOADS
   STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL LOADS ON THE COMPLETED STRUCTURES. DURING CONSTRUCTION, THE STRUCTURES SHALL BE PROTECTED BY BRACING AND SUPPORTS WHEREVER EXCESSIVE CONSTRUCTION LOADS MAY OCCUR.

6. DRAINAGE SURFACES
   SLOPE DRAINAGE SURFACES UNIFORMLY TO DRAIN. SLOPE SHALL BE 1/4" PER FOOT, EXCEPT WHERE NOTED OTHERWISE ON THE PLANS. AT CONTRACTOR'S OPTION, BOTTOM OF SLAB MAY BE LEVEL AND MAINTAIN A MINIMUM THICKNESS AT FLOOR DRAINS.

B. STRUCTURAL DESIGN DATA

1. GENERAL

   A. BUILDING CODE: 2021 INTERNATIONAL BUILDING CODE WITH CITY OF EVERETT AMENDMENTS
      AND BY REFERENCE ASCE 7-16 WITH SUPPLEMENT 1 MINIMUM DESIGN LOADS FOR AND BUILDINGS AND OTHER STRUCTURES.

   B. OCCUPANCY: U
   C. RISK CATEGORY IV
   D. LOCATION: 47.941° N, 121.828° W, EL 610 FT

2. DESIGN LOADS

   A. DEAD LOAD:
      BUILDING STRUCTURE: ACTUAL PLUS 5 PSF COLLATERAL DEAD LOAD ON ROOF SYSTEM

   B. LIVE LOAD
      BUILDING FLOOR: 250 PSF
      BUILDING ROOF: 25 PSF

   C. SNOW LOAD
      GROUND SNOW LOAD pg: 38 PSF
      FLAT-ROOF SNOW LOAD pf:
      SLOPING ROOF SNOW LOAD, ps: 35 PSF
      SNOW EXPOSURE FACTOR Ce: 1.0
      SNOW LOAD IMPORTANCE FACTOR: I_S: 1.2
      SNOW THERMAL FACTOR Ct: 1.1
      DESIGN TO CONSIDER LOADING FROM SNOW DRIFTING RELATIVE TO ADJACENT BUILDING

   D. WIND DESIGN DATA
      BASIC WIND SPEED (3 SECOND GUST): V_{ULT} = 110 PSF
      WIND EXPOSURE: C
      INTERNAL PRESSURE COEFFICIENT: ENCLOSED. GCpi = +/- .18

   E. EARTHQUAKE DESIGN DATA:

      SEISMIC IMPORTANCE FACTOR: Ie = 1.50
      SEISMIC DESIGN CATEGORY: D
      BASIC FORCE RESISTING SYSTEM: TBD BY PRE ENGINEERED BUILDING SUPPLIER
      SITE CLASS D (DEFAULT)
      S_S = 1.006
      S_1 = 0.354
      S_{MS} = 1.207
      S_{M1} = 0.689
      S_{DS} = 0.805
      S_{D1} = 0.459

      BUILDING PARAMETERS: TBD BY PRE ENGINEERED BUILDING SUPPLIER

      RESPONSE MODIFICATION FACTOR, R
      Cs = SDS x Ie/R
      BUILDING MASS, W
      BASE SHEAR, V

   F. SOILS DATA:

      ASSUMED SOIL BEARING PRESSURE ON STRUCTURAL BACKFILL: 3,000 PSF STATIC, WITH 1/3 INCREASE FOR WIND OR EARTHQUAKE (CAPACITY TO BE CONFIRMED PRIOR TO CONSTRUCTION)

      FROST DEPTH: 24 INCHES
      SLIDING FRICTION COEFFICIENT: 0.45

C. CONCRETE

1. SPECIFICATION
   SEE SPECIFICATIONS FOR COMPLETE REQUIREMENTS FOR MIX DESIGNS, FORMING, REINFORCEMENT, PLACING, CURING, AND FINISHING.

2. DESIGN STRESSES

   A. CAST-IN-PLACE CONCRETE
      - STRUCTURAL CONCRETE OTHERWISE: 4000 PSI AT 28 DAYS
      - PLAIN CONCRETE FOR SIDEWALKS: 3000 PSI AT 28 DAYS

   B. REINFORCING STEEL SHALL BE ASTM A615 DEFORMED BARS, GRADE 60. WELDED WIRE FABRIC SHALL BE ASTM A185 SMOOTH WIRE - fy = 60 KSI MINIMUM.

3. BAR SPLICES
   SPLICES OF REINFORCING STEEL BARS SHALL BE IN ACCORDANCE WITH THE BUILDING CODE AND SHALL BE CLASS B, UNLESS OTHERWISE NOTED. THE LENGTH OF LAP SPLICE OF BARS OF DIFFERENT DIAMETER SHALL BE BASED ON THE SMALLER DIAMETER.

4. STANDARD HOOKS
   BARS ENDING IN RIGHT ANGLE BENDS OR HOOKS SHALL CONFORM TO THE REQUIREMENTS OF THE BUILDING CODE.

5. SLOPING SLABS
   MONOLITHIC SLABS WITH TOPS THAT ARE SLOPED SHALL HAVE BOTTOMS SLOPED THE SAME AMOUNT, MAINTAINING A UNIFORM SLAB THICKNESS, UNLESS OTHERWISE NOTED.

6. CHAMFERS
   EXCEPT AS OTHERWISE NOTED, EXPOSED CONCRETE CORNERS AND EDGES SHALL HAVE 3/4" CHAMFERS. RE-ENTRANT CORNERS SHALL NOT HAVE FILLETS.

7. CONSTRUCTION JOINTS
   ENGINEER APPROVAL IS REQUIRED FOR ANY CONSTRUCTION JOINTS NOT SHOWN ON THE DRAWINGS. CONSTRUCTION JOINTS SHALL BE DETAILED AS SHOWN ON THE DRAWINGS.

D. NON-SHRINK GROUT

GROUT FOR BASE PLATES, EQUIPMENT ANCHORAGE AND GENERAL PURPOSES SHALL BE APPROVED, NON-SHRINK CEMENTITIOUS GROUT CONTAINING NATURAL AGGREGATES DELIVERED TO THE JOB SITE IN FACTORY PREPACKAGED CONTAINERS REQUIRING ONLY THE ADDITION OF WATER, ASTM C1107 TYPE B OR C.

E. STEEL: (MINIMUM STANDARDS ARE SHOWN) FINAL MATERIAL STANDARDS TBD BY PEMB CONTRACTOR

1. CODE AND SPECIFICATIONS

   STEEL CONSTRUCTION SHALL CONFORM TO THE SPECIFICATIONS AND STANDARDS\
   AS CONTAINED IN THE 14TH EDITION OF THE AISC MANUAL OF STEEL CONSTRUCTION.

2. MATERIAL

   ALL CARBON STEEL SHALL CONFORM TO THE FOLLOWING:
   W-SHAPES ASTM A992, FY=50 KSI ASTM A913, FY=50 KSI
   ALL ANGLES AND CHANNELS ASTM A36, FY=36 KSI UNLESS NOTED OTHERWISE
   SQUARE OR RECTANGULAR ASTM A500, GRADE B, STRUCTURAL TUBE (HSS) FY=46 KSI
   STEEL PIPE DIAMETER LESS THAN OR EQUAL TO 12 INCHES ASTM A53, TYPE E OR S, FY=35 KSI

   ALL OTHER STEEL UNLESS ASTM A572, FY=50 KSI NOTED OTHERWISE ASTM A588, FY=50 KSI

   ALL STAINLESS STEEL SHALL CONFORM TO THE FOLLOWING:
   PLATE, TEES, AND CHANNELS, ASTM A276
   WIDE FLANGE SHAPES, ASTM 1069

3. STEEL STANDARDS

   ALL STEEL WORK SHALL BE IN ACCORDANCE WITH THE AISC SPECIFICATION. SHOP DRAWINGS SHALL BE SUBMITTED AND REVIEWED BY THE ENGINEER BEFORE COMMENCING FABRICATION. ALL STEEL ANCHORS AND TIES AND OTHER MEMBERS EMBEDDED IN CONCRETE OR MASONRY SHALL BE LEFT UNPAINTED. DIMENSIONAL TOLERANCE FOR BUILT-UP MEMBERS SHALL BE PER AWS D1.1.

   STEEL BEAMS ARE EQUALLY SPACED BETWEEN DIMENSION POINTS AT THE MAXIMUM DECK SPAN LOCATION UNLESS NOTED OTHERWISE. MINIMUM CONNECTIONS SHALL BE A TWO-BOLT CONNECTION USING 7/8-INCH-DIAMETER A325 BOLTS IN SINGLE SHEAR. ALL HIGH-STRENGTH BOLTS SHALL BE INSTALLED, TIGHTENED, AND INSPECTED IN ACCORDANCE WITH THE RCSC. BOLTS IN CONNECTIONS OF BEAM- TO-BEAM/GIRDER MAY BE SNUG TIGHT, UNLESS SPECIFICALLY CALLED OUT AS SLIP CRITICAL (SC). ALL OTHER BOLTED CONNECTIONS SHALL SATISFY THE CRITERIA FOR SLIP-CRITICAL CONNECTIONS UNLESS NOTED OTHERWISE AS SNUG- TIGHT. WHERE CONNECTIONS ARE NOTED AS SNUG-TIGHT, THE CONTRACTOR MAY INSTALL PER THE CRITERIA FOR SNUG-TIGHT BOLTS. SLIP-CRITICAL CONNECTIONS SHALL USE LOAD INDICATOR WASHERS OR TENSION CONTROL BOLTS. ALL ASTM A307 BOLTS SHALL BE PROVIDED WITH LOCK WASHERS UNDER NUTS OR SELF-LOCKING NUTS. ALL BOLT HOLES SHALL BE STANDARD SIZE UNLESS NOTED OTHERWISE.THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ERECTION AIDS THAT INCLUDE, BUT ARE NOT LIMITED TO, ERECTION ANGLES, LIFT HOLES, AND OTHER AID.

4. STRUCTURAL STEEL WELDING

   STRUCTURAL STEEL SHOP DRAWINGS SHALL SHOW ALL WELDING WITH AWS A2.4 SYMBOLS. ALL WELDING SHALL BE DONE BY AWS/WABO (WASHINGTON ASSOCIATION OF BUILDING OFFICIALS) CERTIFIED WELDERS AND IN ACCORDANCE WITH AWS D1.1. WELDS SHOWN ON THE DRAWINGS ARE THE MINIMUM SIZES. INCREASE WELD SIZE TO AWS MINIMUM SIZES, BASED ON PLATE THICKNESS. THE MINIMUM WELD SIZE SHALL BE 3/16 INCH. FIELD WELDING SYMBOLS HAVE NOT NECESSARILY BEEN INDICATED ON THE DRAWINGS. WHERE SHOWN, PROPER FIELD WELDING PER AWS D1.1 SHALL BE USED. WHERE NO FIELD WELDING SYMBOLS ARE SHOWN, IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE USE OF SHOP AND FIELD WELDS. ALL PARTIAL JOINT PENETRATION GROOVE WELD SIZES SHOWN ON THE DRAWINGS REFER TO EFFECTIVE THROAT THICKNESS. ALL WELDS SHALL BE MADE USING LOW HYDROGEN ELECTRODES WITH MINIMUM TENSILE STRENGTH PER AWS D1.1 (MINIMUM 70 KSI) FOR CARBON STEEL AND PER AWS D1.6 FOR STAINLESS STEEL. LOW HYDROGEN SMAW ELECTRODES SHALL BE USED WITHIN 4 HOURS OF OPENING THEIR HERMETICALLY SEALED CONTAINERS, OR SHALL BE REBAKED PER AWS D1.1, SECTION 4.5. ELECTRODES SHALL BE REBAKED NO MORE THAN ONE TIME, AND ELECTRODES THAT HAVE BEEN WET SHALL NOT BE USED.

   ALL WELDING SHALL BE PERFORMED IN STRICT ADHERENCE TO A WRITTEN WELDING PROCEDURE SPECIFICATION (WPS) PER AWS D1.1 OR AWS D1.6. ALL WELDING PARAMETERS SHALL BE WITHIN THE ELECTRODE MANUFACTURER'S RECOMMENDATIONS. WELDING PROCEDURES SHALL BE SUBMITTED TO THE OWNER'S TESTING AGENCY FOR REVIEW BEFORE STARTING FABRICATION OR ERECTION. COPIES OF THE WPS SHALL BE ON SITE AND AVAILABLE TO ALL WELDERS AND THE SPECIAL INSPECTOR.

   ALL COMPLETE JOINT PENETRATION WELDS SHALL BE ULTRASONICALLY TESTED UPON COMPLETION OF THE CONNECTION, EXCEPT PLATE LESS THAN OR EQUAL TO 1/4 INCH THICK SHALL BE MAGNETIC PARTICLE TESTED. REDUCTION IN TESTING MAY BE MADE IN ACCORDANCE WITH THE BUILDING CODE WITH APPROVAL OF THE ENGINEER.

   THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE JOINT PREPARATIONS AND WELDING PROCEDURES THAT INCLUDE, BUT ARE NOT LIMITED TO: REQUIRED ROOT OPENINGS, ROOT FACE DIMENSIONS, GROOVE ANGLES, BACKING BARS, COPES, SURFACE ROUGHNESS VALUES, AND TAPERS AND TRANSITIONS OF UNEQUAL PARTS.

   DEMAND-CRITICAL WELDS ARE LOCATED AS SHOWN IN THE DRAWINGS AND AT A MINIMUM SHALL BE USED FOR THE FOLLOWING CONNECTIONS:

1. COMPLETE JOINT PENETRATION WELDS AT COLUMN SPLICES AT BRACED FRAMES.

2. COMPLETE JOINT PENETRATION WELDS AT COLUMN BASE PLATES AT BRACED FRAMES.

3. COMPLETE JOINT PENETRATION WELDS AT BEAM FLANGES, SHEAR PLATES, AND BEAM WEBS TO COLUMN FLANGES FOR SPECIAL MOMENT FRAMES.

5. BOLTS

   BOLTS IN BUILDING FRAMING CONSTRUCTION SHALL BE ASTM A325 BOLTS. UNLESS OTHERWISE NOTED ALL BOLTS SHALL BE INSTALLED, TIGHTENED, AND INSPECTED IN ACCORDANCE WITH THE RCSC. BOLTS IN CONNECTIONS OF BEAM- TO-BEAM/GIRDER MAY BE SNUG TIGHT, UNLESS SPECIFICALLY CALLED OUT AS SLIP CRITICAL (SC). ALL OTHER BOLTED CONNECTIONS SHALL SATISFY THE CRITERIA FOR SLIP-CRITICAL CONNECTIONS UNLESS NOTED OTHERWISE AS SNUG- TIGHT.
   SLIP-CRITICAL CONNECTIONS SHALL USE LOAD INDICATOR WASHERS OR TENSION CONTROL BOLTS.

   ALL BOLT HOLES SHALL BE STANDARD SIZE UNLESS NOTED OTHERWISE. BOLTS FOR OTHER THAN BUILDING FRAMING CONSTRUCTION SHALL BE STAINLESS STEEL CONFORMING TO F593 GROUP 2 CONDITION AF OR CW WITH NUTS AND WASHERS OF MATCHING MATERIAL CONFORMING TO ASTM F594.

   ALL ASTM A307 BOLTS SHALL BE PROVIDED WITH LOCK WASHERS UNDER NUTS OR SELF-LOCKING NUTS. ALL BOLT HOLES SHALL BE STANDARD SIZE UNLESS NOTED OTHERWISE.

6. ANCHOR RODS

   ANCHOR RODS SHALL BE ASTM F1554 GRADE 36 WITH CLASS 2A THREADS, UNLESS NOTED OTHERWISE. FURNISH ANCHOR RODS PREFABRICATED WITH MATCHING DOUBLE HEAVY HEX NUTS JAMMED AT THE END EMBEDDED IN CONCRETE. FURNISH HARDENED PLATE WASHERS, LOCK WASHERS, AND MATCHING HEAVY HEX NUTS FOR SECURING THE BASE PLATE TO THE ANCHOR RODS. HOOKED ANCHOR RODS SHALL NOT BE USED EXCEPT WHERE NOTED. ANCHOR RODS SHALL HAVE SUFFICIENT LENGTH TO PROVIDE THE MINIMUM EMBEDMENT SHOWN ON THE DRAWINGS, MEASURED FROM THE FACE OF THE CONCRETE TO THE NEAR FACE OF THE DOUBLE NUT, WITH ADEQUATE EXTENSION AS REQUIRED TO RECEIVE THE BASE PLATE WITH FULL THREAD PROJECTION FOR NUT INSTALLATION. ANCHOR ROD INSTALLATION SHALL BE COORDINATED WITH REINFORCING AND FORMWORK. NO HEATING OR BENDING OF THE ANCHOR RODS IS PERMITTED. HOLES IN THE BASE MATERIAL SHALL NOT BE ENLARGED BY BURNING.

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Designed K. Dahl, S.E., P.E.
Drawn A. BRADLEY
Checked R. DORN, P.E.
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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

STRUCTURAL

STRUCTURAL GENERAL NOTES 1 OF 2

Drawing S1

Sheet No. 14 / 31 Of Total

Plot date 5/30/2024 11:46 AM Plotted by Svetlana Olcoe Last saved by solcoe Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
File path\Filename S:\CAD\EVERETT\23-10858 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_S1.DWG

GENERAL STRUCTURAL NOTES

G. WOOD

1. FRAMING LUMBER

FRAMING LUMBER SHALL BE KILN DRIED OR MC-15, AND GRADED AND MARKED IN CONFORMANCE WITH WEST COAST LUMBER INSPECTION BUREAU STANDARD GRADING RULES FOR WEST COAST LUMBER NO. 16, LATEST EDITION. FURNISH TO THE FOLLOWING MINIMUM STANDARDS: UNLESS NOTED OTHERWISE.

2x JOISTS AND BUILT-UP MEMBERS	HEM-FIR NO. 2
3x AND 4x BEAMS AND POSTS	DOUGLAS FIR-LARCH NO. 2
6x AND LARGER BEAMS AND STRINGERS	DOUGLAS FIR-LARCH NO. 1
6x AND LARGER POSTS AND TIMBERS	DOUGLAS FIR-LARCH NO. 1
STUDS, PLATES AND MISCELLANEOUS LIGHT FRAMING	DOUGLAS FIR-LARCH OR HEM-FIR STANDARD GRADE
TOP AND BOTTOM PLATES AT BEARING WALLS	DOUGLAS FIR-LARCH CONSTRUCTION GRADE
BOLTED STUDS, LEDGERS AND PLATES	DOUGLAS FIR-LARCH STANDARD GRADE
2x TONGUE AND GROOVE DECKING	DOUGLAS FIR-LARCH STANDARD GRADE

2. PLYWOOD

IF NEEDED, PLYWOOD SHEATHING SHALL BE GRADE C-D EXTERIOR GLUE OR STRUCTURAL II. EXTERIOR GLUE SHALL BE IN CONFORMANCE WITH THE BUILDING CODE, UNITED STATES VOLUNTARY PRODUCT STANDARDS PS-1 AND PS-2. ORIENTED STRAND BOARD OF EQUIVALENT THICKNESS, EXPOSURE RATING, AND PANEL INDEX MAY BE USED IN LIEU OF PLYWOOD

3. ROOF SHEATHING

IF NEEDED, PROVIDE 15/32 INCH-CDX-PLYWOOD, INDEX 32/16, BLOCKED, LAID UP WITH FACE GRAIN PERPENDICULAR TO FRAMING BELOW. STAGGER PANEL END JOINTS. PROVIDE APPROVED EDGE CLIPS AT 24 INCHES ON CENTER AT UNBLOCKED ROOF SHEATHING EDGES. PROVIDE 1/8-INCH GAP BETWEEN ALL ABUTTING PANEL EDGES. PROVIDE THE FOLLOWING MINIMUM NAILING UNLESS NOTED OTHERWISE ON PLANS:

10d AT 6 INCHES ON CENTER ALL SUPPORTED PANEL EDGES, DIAPHRAGM BOUNDARIES AND OVER EXTERIOR WALLS AND SHEAR WALLS

10d AT 12 INCHES ON CENTER FIELD NAILING

4. TREATED WOOD

ALL WOOD PLATES, LEDGERS, AND BLOCKING IN DIRECT CONTACT WITH CONCRETE OR MASONRY SHALL BE PRESSURE-TREATED WITH AN AMERICAN WOOD PRESERVERS ASSOCIATION (AWPA) APPROVED PRESERVATIVE. ALTERNATIVELY PER IBC SECTION 2304.11, FOR SOME EXCEPTIONS, IMPERVIOUS MOISTURE BARRIERS MAY BE PROVIDED BETWEEN UNTREATED MEMBERS AND CONCRETE OR MASONRY.

ALL METAL FASTENERS IN CONTACT WITH TREATED WOOD SHALL BE GALVANIZED PER ASTM F2329 OR STAINLESS STEEL. WHEN USING GALVANIZED FASTENERS, THE CONTRACTOR SHALL VERIFY THE GALVANIZATION PROCESS WITH THE CHEMICAL COMPOSITION OF THE WOOD TREATMENT.

5. TIMBER CONNECTORS

TIMBER CONNECTORS CALLED OUT BY LETTERS AND NUMBERS SHALL BE BY SIMPSON STRONG-TIE COMPANY, INC, AS SPECIFIED IN THE LATEST EDITION OF THEIR CATALOG. EQUIVALENT DEVICES BY OTHER MANUFACTURERS MAY BE SUBSTITUTED, PROVIDED THEY HAVE CURRENT ICC-ES EVALUATION REPORTS DEMONSTRATING THAT THE PRODUCTS HAVE EQUAL OR GREATER LOAD CAPACITIES. PROVIDE NUMBER AND SIZE OF FASTENERS AS SPECIFIED BY MANUFACTURER. CONNECTORS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S PUBLISHED SPECIFICATIONS. WHERE CONNECTOR STRAPS CONNECT TWO MEMBERS, PLACE ONE-HALF OF THE NAILS OR BOLTS IN EACH MEMBER. ALL BOLTS IN WOOD MEMBERS SHALL CONFORM TO ASTM A307. PROVIDE WASHERS UNDER THE HEADS AND NUTS OF ALL BOLTS AND LAG SCREWS BEARING ON WOOD. UNLESS NOTED OTHERWISE, ALL NAILS SHALL BE COMMON. ALL SHIMS SHALL BE SEASONED AND DRIED AND THE SAME GRADE (MINIMUM) AS MEMBERS CONNECTED. ALL SINGLE JOISTS, DOUBLE JOISTS, AND TRIPLE JOISTS SHALL BE CONNECTED TO FLUSH BEAMS WITH "U" SERIES JOIST HANGERS.

6. NAILS

ALL NAILS SHALL CONFORM TO ASTM F1667. ALL NAILING SHALL BE WITH COMMON WIRE NAILS OR APPROVED EQUAL. PER I.B.C. 2304.10.5, ALL NAILS AND FASTENERS IN PRESSURE-TREATED OR FIRE RETARDANT WOOD SHALL BE HOT-DIPPED ZINC GALVANIZED STEEL, STAINLESS STEEL, SILICONE BRONZE, COPPER, OR APPROVED EQUAL TYPICAL UNLESS NOTED OTHERWISE. NAILS SPECIFIED PENNYWEIGHT SHALL HAVE THE FOLLOWING MINIMUM PROPERTIES:

PENNY-WEIGHT	LENGTH	SHANK DIAMETER	NAIL BEDDING YIELD STRENGTH, FBy
8d	2.5"	0.131"	100,000 PSI
10d	3"	0.148"	90,000 PSI
12d	3.25"	0.148"	90,000 PSI
16d	3.5'	0.162"	90,000 PSI

H. METAL ROOF AND SIDING PANELS: (MINIMUM STANDARDS ARE SHOWN) FINAL MATERIAL STANDARDS TBD BY PEMB CONTRACTOR

PROVIDE WEATHERTIGHT PREFORMED METAL ROOF PANELS. PANEL PROFILE SHALL BE AEP DESIGN SPAN HP WITH STRIATIONS, 16" COVERAGE OR APPROVED EQUIVALENT. PANELS SHALL BE MANUFACTURER FROM 22 GA MINIMUM ASTM A792, GRADE 50, STEEL. PROVIDE PROTECTIVE COATINGS PER ASTM A792. ATTACH PANELS TO FRAMING PER MANUFACTURER REQUIREMENTS TO RESIST UL 90 UPLIFT LOADING. PROVIDE A COMPLETE WATERPROOF SYSTEM INCLUDING REQUIRED FLASHING, END STOPS, AND OTHER ACCESSORIES.

I. FOUNDATION PREPARATION

FOUNDATIONS, UNLESS NOTED OTHERWISE IN THE GEOTECHNICAL REPORT, SHALL BEAR ON UNDISTURBED, DENSE ALLUVIAL SOIL. IF UNDISTURBED, DENSE ALLUVIAL SOIL IS NOT FOUND AT THE BOTTOM OF THE FOOTING ELEVATION. WEAK MATERIAL SHALL BE REMOVED AND REPLACED WITH COMPACTED BACKFILL IN ACCORDANCE WITH THE SPECIFICATIONS. PROVIDE GRADED CRUSHED OR NATURAL ROCK BASE COURSE BENEATH CONCRETE SLABS OR FOOTINGS WHERE INDICATED.

BACKFILL SHALL BE COMPACTED TO 95% OF MAXIMUM DENSITY USING ASTM D1557.

J. DEFERRED STRUCTURAL SUBMITTALS

SOME STRUCTURAL SYSTEMS ARE DEFINED AS VENDOR-DESIGNED COMPONENTS PER STRUCTURAL DOCUMENTS. THE ELEMENTS OF DESIGN ARE DEFERRED SUBMITTAL COMPONENTS AND HAVE NOT BEEN PERMITTED UNDER THE BASE BUILDING APPLICATION. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT THE STAMPED COMPONENT SYSTEM DOCUMENTS TO THE BUILDING OFFICIAL FOR APPROVAL.

DOCUMENTS FOR PREFERRED SUBMITTAL ITEMS SHALL BE SUBMITTED TO THE ARCHITECT, WHO SHALL REVIEW THEM FOR GENERAL CONFORMANCE TO THE DESIGN OF THE BUILDING. THE CONTRACTOR SHALL SUBMIT THESE REVIEWED DEFERRED SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY THE BUILDING OFFICIAL.

THE FOLLOWING LIST INCLUDES THE ITEMS THAT ARE DEFINED AS DEFERRED STRUCTURAL SUBMITTAL COMPONENTS. REFER TO THE ARCHITECTURAL, MECHANICAL. ELECTRICAL, AND CIVIL DRAWINGS FOR ADDITIONAL DEFERRED SUBMITTAL COMPONENTS.

DEFERRED STRUCTURAL SUBMITTAL COMPONENTS:

STEEL PRIMARY STRUCTURE INCLUDING COLUMNS, BEAMS AND BRACING

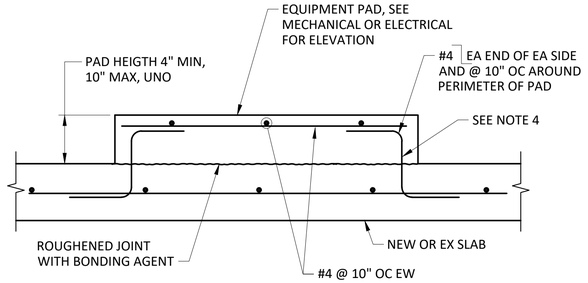
ROOF DECK

SIDING

SIDING AND ROOFING JOISTS AND BEAM BACKUP STRUCTURE

K. STRUCTURAL OBSERVATIONS

THE ENGINEER OF RECORD SHALL PROVIDE VISUAL OBSERVATION OF THE STRUCTURAL SYSTEM, FOR GENERAL CONFORMANCE TO THE APPROVED PLANS AND SPECIFICATIONS, AT SIGNIFICANT CONSTRUCTION STAGES AND AT THE COMPLETION OF THE STRUCTURAL SYSTEM. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE RESPONSIBILITY FOR THE INSPECTIONS REQUIRED BY IBC SECTIONS 109, 1704 OR OTHER SECTIONS OF THE INTERNATIONAL BUILDING CODE. STRUCTURAL OBSERVATION REPORTS SHALL BE ISSUED TO THE OWNER, ARCHITECT, CONTRACTOR, AND BUILDING OFFICIAL AT THE SIGNIFICANT CONSTRUCTION STAGES.



NOTES:

1. PROVIDE EQUIPMENT PADS FOR ALL EQUIPMENT UNLESS NOTED OTHERWISE
2. PROVIDE EQUIPMENT PAD DIMENSIONS, HEIGHT, AND LOCATIONS AS REQUIRED BY THE EQUIPMENT MANUFACTURER AND APPROVED BY THE ENGINEER. VERIFY EQUIPMENT PAD DIMENSIONS, HEIGHT AND LOCATION WITH THE EQUIPMENT MANUFACTURER'S REVIEWED SHOP DRAWINGS BEFORE THE PAD IS INSTALLED.
3. PROVIDE ANCHOR BOLT SIZE, TYPE, QUANTITY, LOCATION, AND THREAD PROJECTION AS REQUIRED BY THE EQUIPMENT MANUFACTURER AND APPROVED BY THE ENGINEER. PROVIDE MINIMUM 1/2" DIAMETER ANCHOR BOLTS. MINIMUM ANCHOR EMBEDMENT SHALL BE 6 INCHES, ANCHORS SHALL BE A MINIMUM OF 6 INCHES FROM PAD EDGE.
4. PAD SHALL BE MINIMUM OF 6 INCHES ALL AROUND WIDER THAN EQUIPMENT.

1 TYP — TYPICAL EQUIPMENT PAD FOR HEIGHT 10 INCHES OR LESS DETAIL

SCALE: NTS

BAR SIZE	L_D	L_{DT}	L_{SB}	L_{SBT}	L_B
3	14	18	18	24	8
4	19	25	25	32	10
5	24	31	31	40	12
6	28	37	37	48	14
7	42	54	54	70	17
8	47	62	62	80	19
9	54	70	70	90	22
10	60	78	78	102	24
11	67	87	87	113	26

NOTES:

1. LENGTHS EXPRESSED IN INCHES.
2. LENGTHS APPLICABLE FOR f'c = 4000 psi, NORMAL WEIGHT CONCRETE ONLY, AND REINFORCEMENT WITH fy=60,000 PSI
3. L_D TENSION DEVELOPMENT LENGTH, BARS OTHER THAN TOP BARS
   L_{DT} TENSION DEVELOPMENT LENGTH, TOP BARS (SEE NOTE 4)
   L_{SB} CLASS B TENSION SPLICE, BAR SPACING
   L_{SBT} CLASS B TENSION SPLICE, TOP BARS (SEE NOTE 4)
   L_B COMPRESSION DEVELOPMENT LENGTH, BOTTOM BAR OR DOWEL
4. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12 INCHES OF CONCRETE CAST BELOW THE BARS.
5. FOR EPOXY COATED BARS, INCREASE ALL LENGTHS 50 PERCENT.
6. USE OF THIS CHART IS RESTRICTED TO BARS WITH CONCRETE COVER OF AT LEAST ONE BAR DIAMETER AND CLEAR SPACE BETWEEN BARS OF AT LEAST TWO BAR DIMENSIONS. FOR OTHER SITUATIONS, SPLICE LENGTHS SHALL BE INCREASED BY 50%, EXCEPT FOR L_B.

2 TYP — CONCRETE REIFORCING BAR LAP SLICE AND DEVELOPMENT LENGTHS DETAIL

SCALE: NTS

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID			CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD
	06-2024	JFG						

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

STRUCTURAL

STRUCTURAL GENERAL NOTES 2 OF 2

Drawing S2

Sheet No. 15 / 31 Of Total

Plot date 5/30/2024 4:08 PM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
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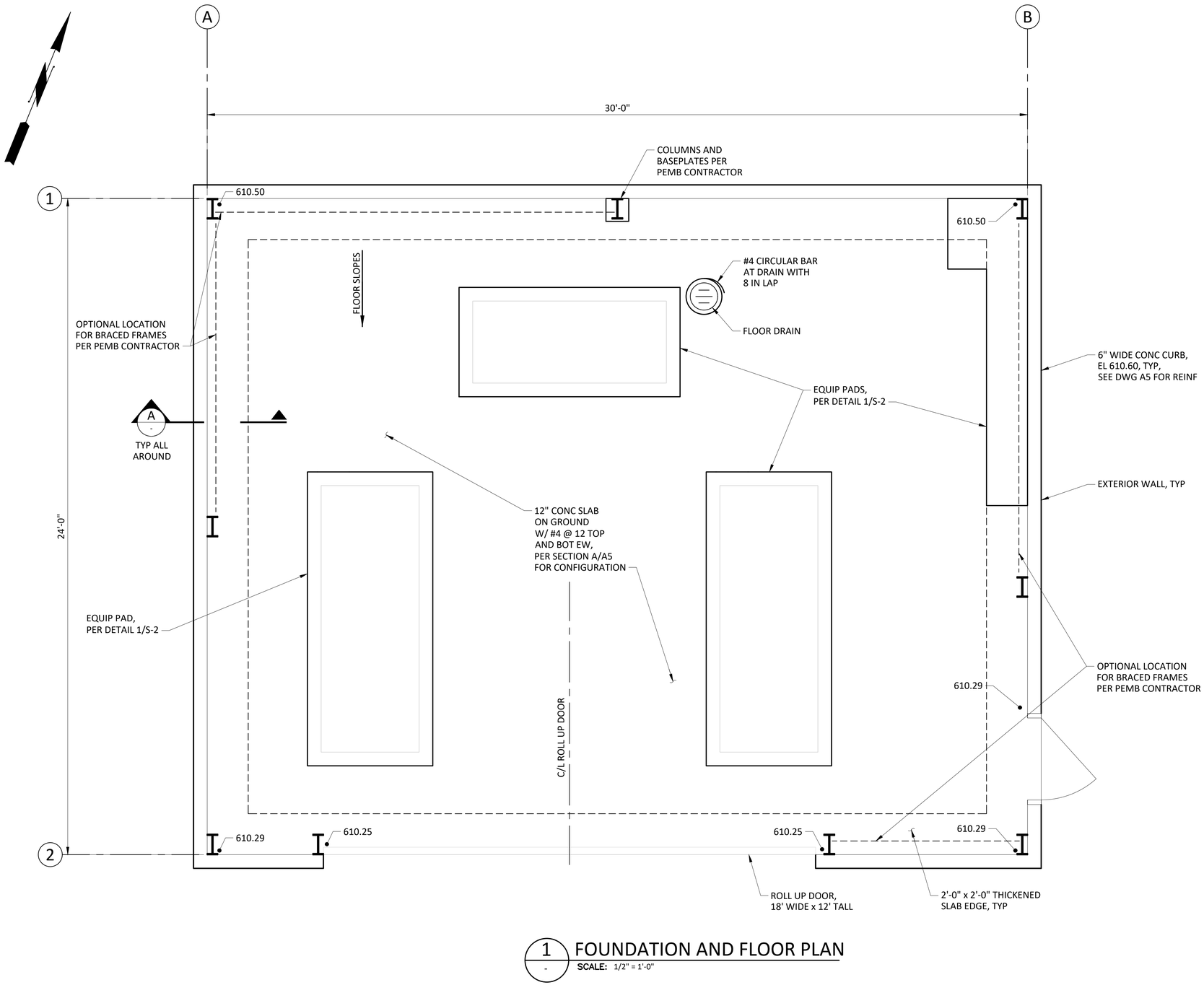
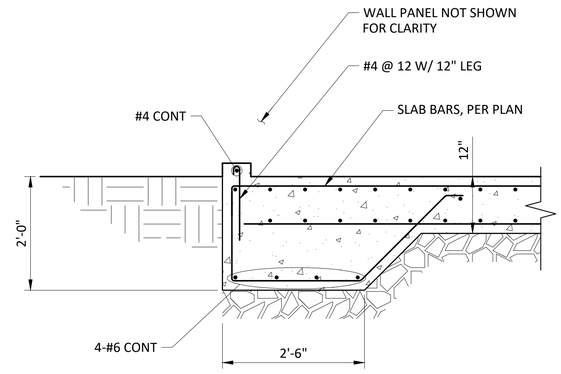


1 FOUNDATION AND FLOOR PLAN
SCALE: 1/2" = 1'-0"

NOTES:

1. 6" MINIMUM DISTANCE FROM EQUIPMENT EDGE TO OUTSIDE OF EQUIPMENT PAD.



A SECTION
SCALE: NTS

NO.	DATE	APRVD	REVISION
			PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

STRUCTURAL

FOUNDATION AND FLOOR PLAN

Drawing S3
Sheet No. 16 / 31 Of Total

Plot date 5/30/2024 4:11 PM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
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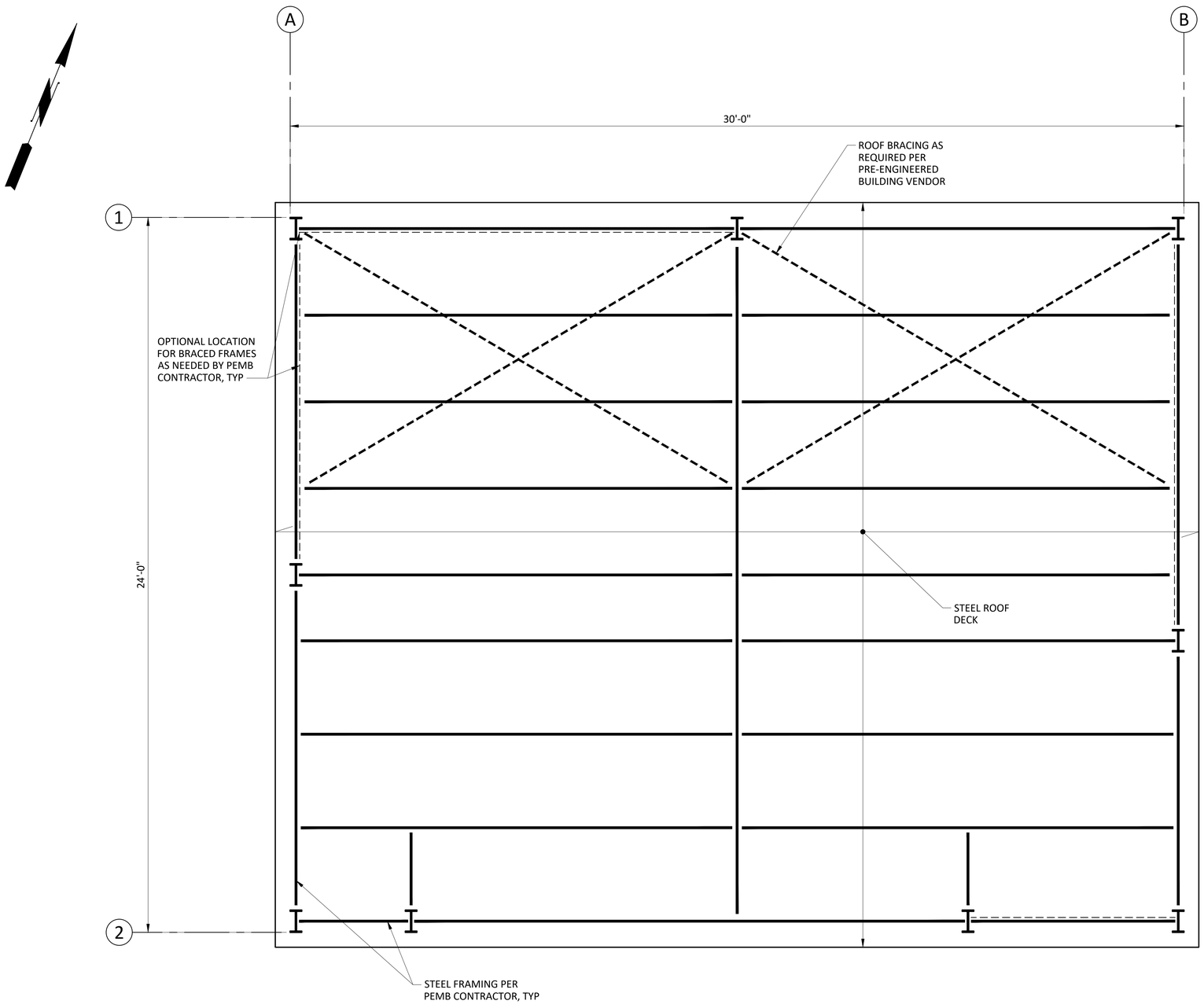

1 / - ROOF FRAMING PLAN

SCALE: 1/2" = 1'-0"

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

STRUCTURAL

ROOF FRAMING PLAN

Drawing S4

Sheet No. 17 / 31 Of Total

Plot date 5/30/2024 4:14 PM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
File path\Filename S:\CAD\EVERETT\23-10888 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_S4.DWG

GENERAL LEGEND

NORTH ARROW

DETAIL, DRAWING REFERENCE

SECTION REFERENCE

CONSTRUCTION NOTE

REVISION SYMBOL

POINT OF CONNECTION

BOLD LINE WEIGHT INDICATES NEW WORK

LIGHT LINE WEIGHT INDICATES EXISTING

SLASHED LINE INDICATES EXISTING WORK TO BE DEMOLISHED

WASHINGTON ENERGY CODE

1. BALANCE ALL HVAC SYSTEMS IN ACCORDANCE WITH THE WASHINGTON STATE ENERGY CODE 2021 EDITION, GENERALLY ACCEPTED ENGINEERING STANDARDS AND IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. SEE APPLICABLE SPECIFICATION SECTIONS.
2. PROVIDE CONTROLS IN ACCORDANCE WITH THE WASHINGTON STATE ENERGY CODE 2021 EDITION, INCLUDING SECTIONS C405.2 FOR LIGHTING, C406.2.1 FOR HVAC CONTROL, C403.2.2 FOR VENTILATION, C403.8.3 FOR FAN EFFICIENCY, AND IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, SEE TEMPERATURE CONTROL SPECIFICATION SECTIONS AND ALL OTHER APPLICABLE SPECIFICATION SECTIONS.
3. ALL MECHANICAL EQUIPMENT SHALL BE LISTED AND APPROVED BY A TESTING AGENCY.

VENTILATION LEGEND

SINGLE LINE DUCTWORK INDICATES VIEW DIMENSION LESS THAN 12 INCHES

SUPPLY OR EXHAUST TAKEOFF

SUPPLY DUCT TURNING TOWARD

SUPPLY DUCT TURNING AWAY

EXHAUST DUCT TURNING TOWARD

EXHAUST DUCT TURNING AWAY

ROUND DUCT TURNING TOWARD

ROUND DUCT TURNING AWAY

TRANSITION

SMOKE DAMPER

MOTORIZED DAMPER

FIRE SMOKE DAMPER

VOLUME DAMPER

FIRE DAMPER

ACCESS DOOR, ACCESS PANEL

FLEXIBLE CONNECTION

TURNING VANES

FLEXIBLE DUCT

2'x2' SUPPLY DIFFUSER

2' DIAMETER SUPPLY DIFFUSER

1'x2' EXHAUST GRILLE

2'x2' EXHAUST GRILLE

2'x4' EXHAUST GRILLE

THERMOSTAT

EQUIPMENT TAG

GENERAL ABBREVIATIONS

ABV	ABOVE
AFF	ABOVE FINISHED FLOOR
APPROX	APPROXIMATELY
ARCH	ARCHITECT; ARCHITECTURAL
AUX	AUXILIARY
BAL	BALANCING
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
CAP	CAPACITY
CL	CENTERLINE
CMU	CONCRETE MASONRY UNIT
COND	CONDENSATE
COL	COLUMN
CONC	CONCRETE
CONN	CONNECT; CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS; CONTINUATION
CONTR	CONTRACTOR
COORD	COORDINATE
D	DEEP; (DIM)
DEG	DEGREE
DIA	DIAMETER
DIAG	DIAGONAL; DIAGRAM
DIFF	DIFFERENTIAL
DIM	DIMENSION
DISCH	DISCHARGE
DIV	DIVISION
DN	DOWN
DR	DRAIN
DWG	DRAWING
EA	EACH
EFF	EFFICIENCY
ELEC	ELECTRICAL
ENT	ENTERING
EQ	EQUAL
EX, (E)	EXISTING
EXP	EXPOSED
F	FAHRENHEIT
FIN	FINISHED
FLEX	FLEXIBLE
FT	FEET; FOOT; FEET OF WATER(PRESS)
GEN	GENERAL
H	HEIGHT; HIGH
HOR	HORIZONTAL
HP	HORSE POWER
HR	HOUR
HZ	HERTZ
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER
IFC	INTERNATIONAL FIRE CODE
IMC	INTERNATIONAL MECHANICAL CODE
IN	INCH
INFO	INFORMATION
KW	KILOWATT
KWH	KILOWATT HOUR
L	LENGTH; LONG (DIM)
LF	LINEAL FEET
LO	LOW
LTG	LIGHTING
LVG	LEAVING
MAT	MATERIAL
MAX	MAXIMUM
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
MECH	MECHANICAL; MECHANICAL CONTRACTOR
MED	MEDIUM
MFG	MANUFACTURING
MFR	MANUFACTURER
MIN	MINIMUM; MINUTE
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
MTL	METAL
N	NORTH
NA	NOT APPLICABLE
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN; NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
PD	PRESSURE DROP
PERF	PERFORATED
PERP	PERPENDICULAR
POC	POINT OF CONNECTION
PRELIM	PRELIMINARY
PRESS	PRESSURE
QTY	QUANTITY
REF	REFERENCE
REFR	REFRIGERATION
REQD	REQUIRED
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
S	SOUTH
SCHED	SCHEDULE
SECT	SECTION
SF	SQUARE FEET
SHT	SHEET
SIM	SIMILAR
SPEC	SPECIFICATION
SPECD	SPECIFIED
SQ	SQUARE
STD	STANDARD
STRUCT	STRUCTURAL
TBD	TO BE DETERMINED
TEMP	TEMPERATURE
THRU	THROUGH
TYP	TYPICAL
UBC	UNIFORM BUILDING CODE
V	VOLT
VAR	VARIABLE
VERT	VERTICAL
VOL	VOLUME
W	WATER; WIDE(DIM); WATT
W/	WITH
W/O	WITHOUT
WT	WEIGHT

HVAC ABBREVIATIONS

AC	AIR CONDITIONING
AD	AUTOMATIC DAMPER
AF	AIR FOIL
AHU	AIR HANDLING UNIT
BDD	BACKDRAFT DAMPER
BHP	BRAKE HORSEPOWER
BI	BACKWARD INCLINED
BOD	BOTTOM OF DUCT
C	CONDENSATE; COMMON
CC	COOLING COIL
CFM	CUBIC FEET PER MINUTE
CG	CEILING GRILLE
CLG	COOLING
CV	CONSTANT VOLUME
DDC	DIRECT DIGITAL CONTROLS
DMPR	DAMPER
DB	DRY BULB TEMPERATURE(°F)
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
EG	EXHAUST GRILLE
EXH	EXHAUST
FA	FACE AREA
FC	FAN COIL; FORWARD CURVED
FCU	FAN COIL UNIT
FD	FIRE DAMPER
FF	FINAL FILTER
FPM	FEET PER MINUTE
FS	FLOW SWITCH
FV	FACE VELOCITY
GALV	GALVANIZED
GR	GRILLE
HC	HEATING COIL
HTG	HEATING
HV	HEAT AND VENT UNIT
HX	HEAT EXCHANGER
IMC	INTERNATIONAL MECHANICAL CODE
LAT	LEAVING AIR TEMPERATURE
MA	MIXED AIR
OA	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
OSA	OUTSIDE AIR
OV	OUTLET VELOCITY
PF	PREFILTER
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION (GAS)
RHC	REHEAT COIL
RH	RELATIVE HUMIDITY
RA	RETURN AIR
RF	RETURN FAN
RG	RETURN GRILLE
S	SUPPLY
SFD	SMOKE/FIRE DAMPER
SP	STATIC PRESSURE
SD	SMOKE DAMPER; SUPPLY DIFFUSER
SA	SUPPLY AIR; SOUND ATTENUATOR
SF	SUPPLY FAN
SG	SUPPLY GRILLE
SR	SUPPLY REGISTER
T, TSTAT	THERMOSTAT
TEFC	TOTALLY ENCLOSED, FAN COOLED
TG	TRANSFER GRILLE
UMC	UNIFORM MECHANICAL CODE
UH	UNIT HEATER
UV	UNIT VENTILATOR
VAV	VARIABLE AIR VOLUME
VSD	VARIABLE SPEED DRIVE
VENT	VENTILATE; VENTILATION
VD	VOLUME DAMPER
WG	WALL GRILLE; WATER GAGE
WSEC	WASHINGTON STATE ENERGY CODE
WB	WET BULB TEMPERATURE(°F)

SHEET LIST

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	KMC	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

HVAC

SYMBOLS, NOTES, AND ABBREVIATIONS

Drawing H1

Sheet No. 18 / 31 Of Total

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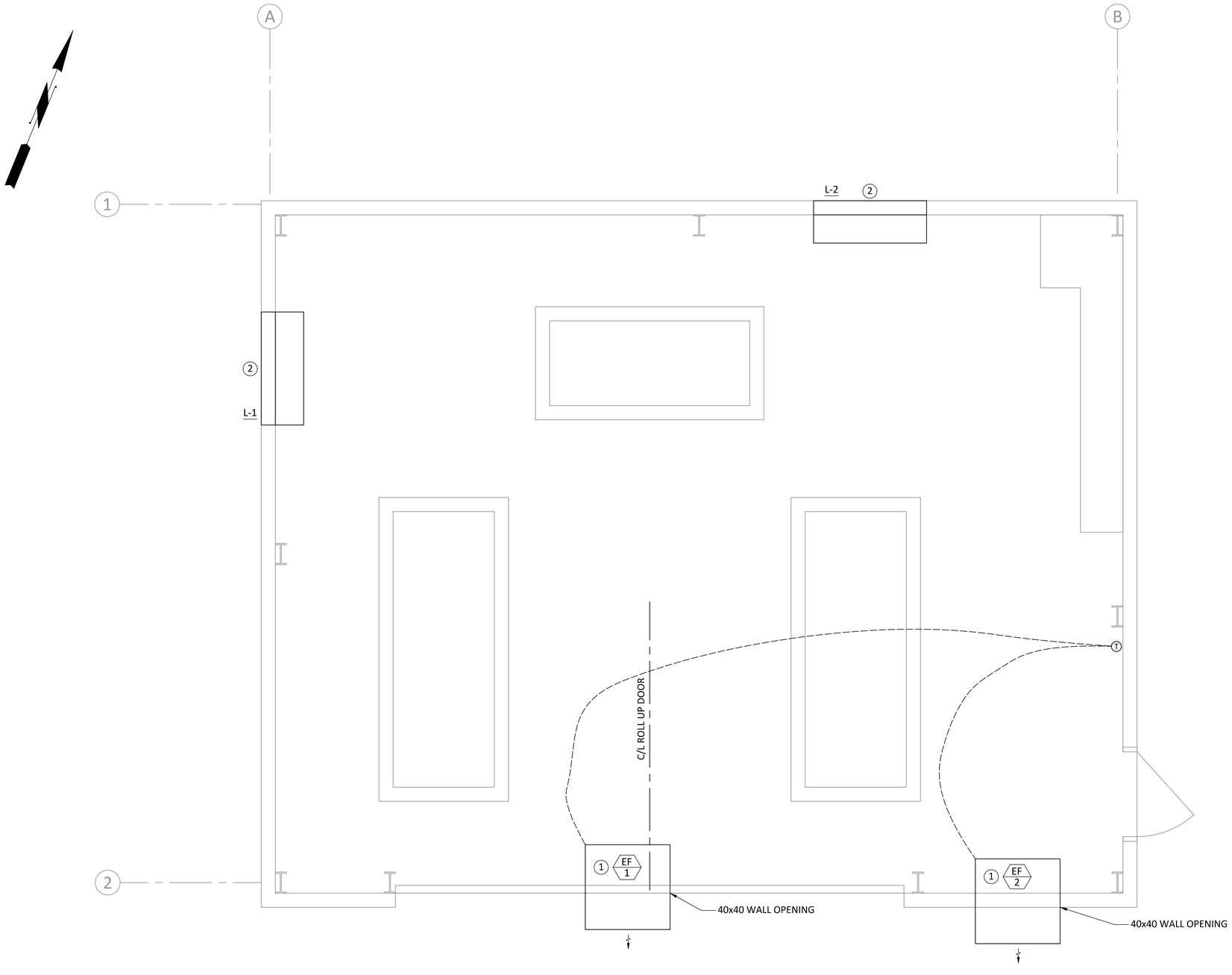

1 / H2 FLOOR PLAN

SCALE: 1/2" = 1'-0"

GENERAL NOTES:

1. ALL WORK IS SHOWN DIAGRAMMATICALLY. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.

CONSTRUCTION NOTES:

(1) INSTALL FAN 16.5' AFF.

(2) INSTALL 4'x4' LOUVER 12" AFF.

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID		06-2024	KMC	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD	

Designed: F. MAAROUF
Drawn: B. BOONE
Checked: K. CHADWICK, P.E.
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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

HVAC

FLOOR PLAN

Drawing: H2

Sheet No. 19 / 31 Of Total

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File path\Filename: I:\2017 EVERETT WWTP BLOWER\WORKING DRAWINGS\3813_H2.DWG

EXHAUST FAN SCHEDULE

CALLOUT					FAN											MAX SOUND LEVEL (DBA)	FEI	BASIS OF DESIGN			NOTES
											ELECTRICAL										
TYPE	MARK	LOCATION	FAN TYPE	SERVICE	CFM	DRIVE TYPE	E.S.P (IN WC) [1]	RPM	HP	BHP	V	HZ	PH	FLA	MOP1			MANUFACTURER	MODEL	WEIGHT (LBS)	
EF	1	WALL	SIDEWALL	BLOWER	5,000	DIRECT	0.37	889	2	0.63	460	60	3	7.2 AMPS	15	15.5	1.98	GREENHECK FAN	AER-30-02-0315VG	110	[2] [4] [5] [6]
EF	2	WALL	SIDEWALL	BLOWER	5,000	DIRECT	0.37	889	2	0.63	460	60	3	7.2 AMPS	15	15.5	1.98	GREENHECK FAN	AER-30-02-0315VG	110	[2] [4] [6]

SCHEDULE NOTES:
[1] STATIC PRESSURE EXTERNAL TO FAN.
[2] PROVIDE WITH EC MOTOR.
[3] AS RATED PER AMCA 205.
[4] SINGLE POINT CONNECTION AND UNIT PROVIDED WITH INTEGRAL DISCONNECT.
[5] PROVIDE WITH GREENHECK VARI GREEN TEMP/HUMIDITY CONTROL.
[6] PROVIDE WITH WALL HOUSING AND WEATHER HOOD ACCESSORIES.

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File path\Filename I:\23017 EVERET1 WWTP BLOWER\WORKING DRAWINGS\3813_H3.DWG

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Designed F. MAAROUF
Drawn B. BOONE
Checked K. CHADWICK, P.E.
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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

HVAC

SCHEDULES

Drawing H3

Sheet No. 20 / 31 Of Total

SEQUENCE OF OPERATION

GENERAL:

ALL PORTIONS OF THE HEATING, VENTILATION AND AIR CONDITIONING (HVAC) SYSTEMS SHALL BE CONTROLLED BY STAND ALONE CONTROLS. ALL SETPOINTS, TIME SETTINGS AND OTHER VALUES SHALL BE ADJUSTABLE UNLESS INDICATED OTHERWISE.

- **BLOWER BUILDING:**

EXHAUST FAN (EF-1 AND EF-2):

EF-1 AND 2 ARE CONTROLLED THROUGH A WALL THERMOSTAT WITH MANUAL TIMED OVERRIDE. IF THE TEMPERATURE IN THE SPACE IS ABOVE 85 DEG F (ADJUSTABLE), THE FANS SHALL BE ENABLED.

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

HVAC

SEQUENCE OF OPERATIONS

Drawing H4

Sheet No. 21 / 31 Of Total

MOTORS AND POWER EQUIPMENT

- GROUND ROD IN GROUND ROD BOX
- T — TRANSFORMER
- MOTOR STARTER W/ DISCONNECT
- 60A — DISCONNECT SWITCH, NON FUSED (60A) INDICATES AMPERAGE RATING
- F, 100, 80FU — DISCONNECT SWITCH, FUSED 100=SWITCH RATING, 80=FUSE RATING
- UTILITY METERING
- M — MOTOR
- F — EXHAUST FAN
- PANELBOARD, SWITCHBOARD, MCC
- 50A — FUSE WITH AMPERE RATING
- PACKAGED POWER AND CONTROL PANEL
- M — UTILITY METERING
- GROUND
- SPD — SURGE PROTECTIVE DEVICE
- SA — SURGE ARRESTER
- DISCONNECT OR SWITCH
- TRANSFORMER
- 15/1 — THERMAL MAGNETIC CIRCUIT BREAKER, RATING/NO. POLES MO = MAGNETIC ONLY
- THERMAL OVERLOAD RELAY
- ATS - AUTOMATIC TRANSFER SWITCH
  MTS - MANUAL TRANSFER SWITCH
- XKVAR — POWER CAPACITOR WITH KVAR RATING
- VFD — VFD = VARIABLE FREQUENCY DRIVE
  VSD = VARIABLE SPEED DRIVE
  SSS = SOLID STATE STARTER
- 15 — MOTOR - NUMBER "15" INDICATES HORSEPOWER
- MS — MS OR M = MOTOR STARTER CONTACTOR
  C = CONTACTOR, BP = BYPASS CONTACTOR
  IC = ISOLATION CONTACTOR
- 3 — CURRENT TRANSFORMER , NUMBER "3" INDICATES NUMBER OF CTS
- PULL OUT SWITCH/PLUG-RECEPTACLE CONNECTION

ELEMENTARY WIRING DIAGRAM SYMBOLS

N.O. NORMALLY OPEN	N.O. NORMALLY CLOSED	
SW	SW	SWITCH
PB	PB	PUSH BUTTON
NO	NC	CONTACT
FS	FS	FLOW SWITCH
LS	LS	LEVEL SWITCH
PS	PS	PRESSURE SWITCH
TS	TS	TEMPERATURE SWITCH
ZS	ZS	LIMIT SWITCH

- FT — INSTRUMENT - FS = FLOW SWITCH, FT = FLOW XMTR, PS= PRESSURE SWITCH, PT = PRESSURE XMTR, ZS = LIMIT SWITCH, VS = VIBRATION SWITCH, VT = VIBRATION XMTR, MS = MOISTURE SWITCH, FE = FLOW ELEMENT, LE = LEVEL ELEMENT, TE = TEMP ELEMENT
- LS — INSTRUMENT - LS = LEVEL SWITCH, TS = TEMPERATURE SWITCH,
- HEATER - HEAT TRACE
- K — KIRK KEY INTERLOCK
- H O A XOO / OOX — HOA = HAND/OFF/AUTO SWITCH; HOR = HAND/OFF/REMOTE SWITCH; OCA = OPEN/CLOSE/AUTO SWITCH; RO = RUN/OFF
- A — INDICATING LIGHT R=RED, G=GREEN, A=AMBER, B=BLUE, W=WHITE
- CR — CONTROL RELAY / CONTACTOR
- TDR — TIME DELAY RELAY
- TWISTED SHIELDED PAIR (TSP)
- SV — SOLENOID VALVE
- RTM — RTM = RUN TIME METER, AMP = AMP METER, CNT = COUNTER; HMI = OPERATOR CONTROL INTERFACE (VFD OPERATOR & DISPLAY)
- SPEED POT
- BATTERY
- HORN
- BLOWN FUSE INDICATOR
- OT1 / R — INDICATING LIGHT:
  A = AMBER G = GREEN W = WHITE
  B = BLUE R = RED
- GIL — SELECTOR SWITCH:
  FOR = FORWARD/OFF/REVERSE
  HOR = HAND/OFF/REMOTE
  HOA = HAND/OFF/AUTO
  RO = RUN/OFF
  POT = POTENTIOMETER
- HOA

RACEWAY SYMBOLS

- A-4 — CONDUIT RUN 3/4"C, UNLESS OTHER WISE SHOWN 4-#12 FOR POWER CIRCUITS TO PANEL "A" CKT "4"
- C-XX — TAGGED CONDUIT RUN - SEE CONDUIT & WIRE SCHEDULE FOR DETAILS.
  P=POWER, C=CONTROL, S=SIGNAL
- D — UNTAGGED CONDUIT RUN - CONTRACTOR TO PROVIDE RACEWAY FOR CONTROL OR SIGNAL WIRING AS REQUIRED BY THE EQUIPMENT , IN ACCORDANCE TO THE WIRING DIAGRAMS, OR AS SPECIFIED.
  CONDUIT SIZE PER NEC; MINIMUM 3/4"
  "C" = (120V) #14 CONTROL WIRE, #12 POWER WIRE
  "S" = TSP SIGNAL WIRE
  "D" = DEVICENET CABLE CONNECTION
  "E" = ETHERNET CABLE CONNECTION (CAT-5)
  "F" = FIRE ALARM PANEL CONNECTION
  PROVIDE # OF WIRES AS REQUIRED.
- CONDUIT TURNED UP OR TOWARD
- RACEWAY TURNED DOWN
- CONDUIT CONCEALED
- CONDUIT EXPOSED
- J — CONDUIT JUNCTION BOX
- PB, HH — PB = PULL BOX, HH = HANDHOLE
  C=CONTROL, S=SIGNAL, P=POWER
- CONDUIT CAPPED
- CORD OR FLEXIBLE CONDUIT

WIRE DIAGRAMS, ONE-LINES, MISC

- EXISTING
- ENCLOSURE
- FIELD WIRING
- PROPOSED WORK/EQUIPMENT
- CONDUCTORS NOT CONNECTED
- CONDUCTORS CONNECTED

REFERENCE SYMBOLS

- 100.1 / 1 — CONDUIT
- L — LIGHTS
- FIT-111 — EQUIPMENT TAG
- 1 — CONSTRUCTION NOTE
- FN # — INSTRUMENT TYPE / FUNCTION; INSTRUMENT DESIGNATION; INSTRUMENT NUMBER
- 1 / - — PHOTO REFERENCE

LIGHTING & RECEPTACLE SYMBOLS

LIGHTING FIXTURES

- LIGHTING FIXTURE
- STRIP LIGHTING FIXTURE
- WALL MOUNTED FIXTURE (SURFACE OR ARM)
- POLE ARM MOUNTED FIXTURE
- RECESSED LIGHT FIXTURE
- INFRARED FLOOD LIGHT FIXTURE
- EXIT LIGHT FIXTURE WALL MOUNTED
- EGRESS LIGHT FIXTURE
- OS — OCCUPANCY SENSOR CEILING MOUNTED

SWITCHES

$ P3a

D	DIMMER	2	DOUBLE POLE
E	EXISTING SWITCH	3	THREE WAY
K	KEY OPERATED SWITCH	4	FOUR WAY
M	MOTOR RATED		
MC	MOMENTARY CONTACT, THREE POSITION	a	LOWER CASE = SWIITCH LEG
P	SWITCH WITH PILOT LIGHT		
R	REOSTATE - SPEED CONTROL		
T	TIMER		
WP	WEATHER PROOF		
XP	EXPLOSION PROOF		

- LS — MAGNETIC LIMIT SWITCH
- KS — KEY SWITCH

SPECIAL PURPOSE CONNECTIONS

- 2 — SPECIAL PURPOSE EQUIPMENT CONNECTION
- 4 — SPECIAL PURPOSE EQUIPMENT CONNECTION WALL MOUNTED

RECEPTACLE OUTLETS

- 2 GFCI — DUPLEX RECEPTACLE OUTLET WALL MOUNTED (NEMA 5-15R UNLESS OTHERWISE SPECIFIED)
- 6 WP — QUADRUPLE RECEPTACLE OUTLET WALL MOUNTED
- DUPLEX RECEPTACLE OUTLET CEILING MOUNTED
- SINGLE RECEPTACLE
- 4 — SPECIAL PURPOSE RECEPTACLE OUTLET
- 6 — SPECIAL PURPOSE RECEPTACLE OUTLET WALL MOUNTED
- DUPLEX DATA OUTLET (RJ45 STYLE)
- (X) — SURFACE METAL RACEWAY WITH RECEPTACLE AT "X" OC

1, 2, 3, ETC ARE CIRCUIT NUMBERS OF PANEL BOARD TO WHICH OUTLET IS TO BE CONNECTED. REFER TO CIRCUIT SCHEDULE.

H	HORIZONTAL
WP	WEATHER PROOF
XP	EXPLOSION PROOF
GFCI	GROUND FAULT CIRCUIT INTERRUPTER

ABBREVIATIONS

A, AMP	AMPERE
AC	AIR COMPRESSOR, ALTERNATING CURRENT
AF	AMPERE FRAME
AFF	ABOVE FINISHED FLOOR
AI	ANALOG INPUT POINT (PLC)
AIC	AMPERES INTERRUPTING CAPACITY
AIL	AMBER INDICATING LIGHT
AL	ALARM
ALT	ALTERNATOR
AM	AMMETER
AO	ANALOG OUTPUT POINT (PLC)
AS	AMPERE SWITCH
ASD	ADJUSTABLE SPEED DRIVE
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
AWWD	ALDERWOOD WATER AND WASTEWATER DISTRICT
BAT	BATTERY
BC	BATTERY CHARGER
BH	BLOCK HEATER
BIL	BLUE INDICATING LIGHT
BKR	BREAKER
BP	BYPASS CONTRACTOR
C	CONDUIT, CONTROL
CAP	CAPACITOR
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CNT	START COUNTER
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CT	CURRENT TRANSFORMER
CU	COPPER
CV	CHECK VALVE
DB	DIRECT BURIED
DC	DIRECT CURRENT
DEM	DEMAND
DF	DEMAND FACTOR
DI	AC DIGITAL INPUT POINT (PLC)
DM	DIGITAL METER
DO	AC DIGITAL OUTPUT POINT (PLC)
DWG	DRAWING
EDP	EMERGENCY DISTRIBUTION PANEL (ON GROUND FLOOR)
EF	EXHAUST FAN
ENCL	ENCLOSURE
EX	EXISTING
F	FUSED
FACP	FIRE ALARM CONTROL PANEL
FS	FLOW SWITCH
FT	FLOW TRANSMITTER
FVNR	FULL VOLTAGE NON-REVERSING
FU	FUSE
FVR	FULL VOLTAGE REVERSING
G, GND	GROUND
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPTER
GFP	GROUND FAULT PROTECTOR
GIL	GREEN INDICATING LIGHT
GRS	(GRC) GALVANIZED RIGID STEEL (CONDUIT)
H	HOT, HIGH, HAND
HH	HAND HOLE
HID	HIGH INTENSITY DISCHARGE
HMI	HUMAN MACHINE INTERFACE
HOA	HAND OFF AUTO (SELECTOR SWITCH)
HP	HORSEPOWER
HS	HAND STATION (HOA SWITCH & POT)
HTR	HEATER
IC	ISOLATION CONTRACTOR
ISR	INTRINSICALLY SAFE RELAY
KCMIL	THOUSAND CIRCULAR MILLS
KV	THOUSAND VOLTS
KVA	KILO VOLT AMPS
KVAR	KILO VOLT AMP REACTIVE
KVARH	KILOVAR HOUR
KW	KILOWATT
KWH	KILOWATT HOUR
L	LOW , LIGHT
LC	LIGHTING CONTACTOR
LCP	LOCAL CONTROL PANEL
LE	LEVEL ELEMENT
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
LTG	LIGHTING
M	METER, MOTOR
MCC	MOTOR CONTROL CENTER
MCP	MAIN CONTROL PANEL
MFGR	MANUFACTURER
MH	MANHOLE
MO	MAGNETIC ONLY (CIRCUIT BREAKER)
MOV	MOTOR OPERATED VALVE
MS	MOTOR STARTER
MTS	MANUAL TRANSFER SWITCH
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NF	NON FUSED
N.O.	NORMALLY OPEN
OI	OPERATOR INTERFACE
OIT	OPERATOR IN TROUBLE
OL	OVERLOAD RELAY
OT	OVER TEMP
P	POWER
PB	PUSH BUTTON
PBC	PULLBOX (CONTROL)
PBD	PULLBOX (DATA)
PBL	PUSH BUTTON - LIGHTED
PBP	PULLBOX (POWER)
PBS	PULLBOX (SIGNAL)
PCP	POWER AND CONTROL PANEL
PE	PHOTO ELECTRIC RELAY
PFR	PHASE FAILURE RELAY
PLC	PROGRAMMABLE LOGIC CONTROLLER
PMD	POWER MONITORING DEVICE
PNL	PANEL
POT	POTENTIOMETER
PS	PRESSURE SWITCH, PUMP STATION
PSE	PUGET SOUND ENERGY
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE (CONDUIT)
RCP	REMOTE CONTROL PANEL
RIL	RED INDICATING LIGHT
RO	RUN - OFF
RTD	RESISTANCE TEMPERATURE DEVICE
RTM	RUN TIME METER
RV	REDUCED VOLTAGE
RVAT	REDUCED VOLTAGE AUTO TRANSFORMER
S	STARTER
SA	SIGNAL SURGE ARRESTOR
SCH	SCHEDULE
SCL	SEATTLE CITY LIGHT
SE	SERVICE ENTRANCE
SNOPUD	SNOHOMISH PUBLIC UTILITY DISTRICT #1
SPD	SURGE PROTECTIVE DEVICE
SST	STAINLESS STEEL
SSS	SOLID STATE STARTER
SV	SOLENOID VALVE
T	THERMOSTAT
TC	TIME CLOCK
TDOD	TIME DELAY ON DE-ENERGIZATION
TDOE	TIME DELAY ON ENERGIZATION
TDR	TIME DELAY RELAY
TEL	TELEPHONE
TNI	TELEPHONE NETWORK INTERFACE
TS	TEMPERATURE SWITCH
TSP	TWISTED SHIELDED PAIR
TST	TWISTED SHIELDED THREE WIRE
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSER
TYP	TYPICAL
UH	UNIT HEATER
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VS	VIBRATION SWITCH
VFD	VARIABLE FREQUENCY DRIVE
VSD	VARIABLE SPEED DRIVE
W	WATT
WHM	WATT HOUR METER
WIL	WHITE INDICATING LIGHT
WP	WEATHER PROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
XMTR	TRANSMITTER
ZS	LIMIT SWITCH

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ELECTRICAL

ELECTRICAL SYMBOLS AND LEGEND

Drawing E1

Sheet No. 22 of 31 Total

Plot date 5/30/2024 5:04 PM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
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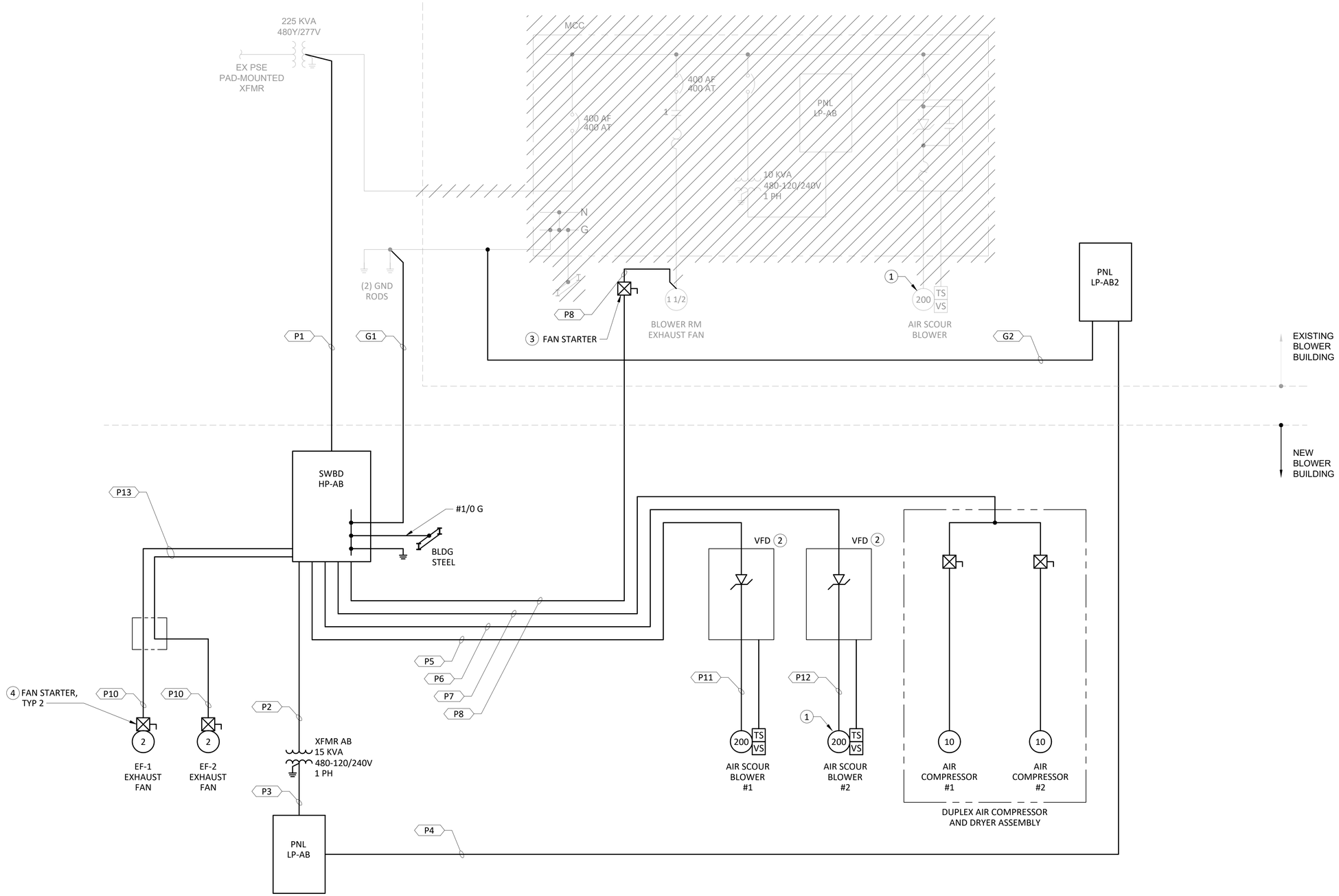

CONSTRUCTION NOTES:

1. RELOCATE THE EXISTING AIR SCOUR BLOWER TO THE NEW BUILDING. BEARING RTDS AND VIBRATION SENSORS TO BE REPLACED WITH NEW.
2. SEE VFD WIRING DIAGRAM, PER DETAIL 1/E8.
3. SEE FAN WIRING DIAGRAM, PER DETAIL 2/E8.
4. FAN STARTER AND DISCONNECT SWITCH INTEGRAL TO FAN ASSEMBLY. SEE HVAC DRAWINGS FOR CONTROL.

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ELECTRICAL

ELECTRICAL ONE-LINE DIAGRAM

Drawing E2

Sheet No. 23 / 31 Of Total

EX TELECOM CLOSET
WITH FIBER PATCH PANEL
ON SECOND LEVEL

UG TLM
UG PWR
W
D
164'-1"
FILTER BLDG
C8
FILTER BLDG
PIPE CHASE
EX (2) 2" C, EACH
WITH 12 ST FO CABLE (2)
EX FIBER J-BOX #1
@ 12' AFF
EX FIBER J-BOX #2
@ 12' AFF
FO1 FO2
FO3 FO4
ROLL-UP DOOR
DOOR
2' W x 1 1/2' H
CONC BENCH
OR FOUNDATION
ALONG OUTSIDE
FACE OF BLDG
4" DI
8" DI DRAIN
CMU WALL
VALVE
BOX
SDMH 1267
FLOCCONTROL
8" CMU
WALL,
2 COURSES
W/ CAP
1" CW
BLOWER BUILDING
CONNECT TO
EX CONDUITS
GROUND
ROD BOX
EX FIBER TERMINAL
BOX ABOVE
CONTROL PANEL (1)
LOCATION OF
FIBER TERMINAL
BOX AND
CONTROL PANEL (1)
YARD
HYDRANT
ROLL-UP
DOOR
CB 1268
METER
BOX W/
BACKFLOW
PREVENTER
CONC
SIDEWALK
P1
BLOWER BLDG
DOOR
6" PVC
ELEC. CONDUIT
TOP/CONDUIT 611.81
BLOWER
TFR
PUD MH
W/ XFMR
ON TOP
6" DI
SURFACE
WASH
CHEMICAL
HYPO (REC)
GRAVEL SURFACE
EL
30" STEEL
BACKWASH
TOP/PIPE 606.35
36" STEEL
WASHWATER
ASPHALT
PAVEMENT,
TYP
CHEMICAL
FEED
SAMPLE LINES
UG TEL
ELECTRICAL
VAULT #2
6" PVC FLOOR DRAIN

CONSTRUCTION NOTES:

1. RELOCATE THE EXISTING FREE-STANDING CONTROL PANEL AND FIBER OPTIC CABLE TERMINATION BOX FROM THE EXISTING BUILDING TO THE NEW BUILDING.
2. REPLACE 12 STRAND FIBER OPTIC CABLES FROM RELOCATED TERMINAL BOX TO SOURCE. DO NOT SPLICE FIBER OPTIC CABLES. TERMINATE ALL STRANDS AT EACH END.
3. CORE DRILL EXISTING CONCRETE WALL FOR CONDUIT PENETRATION. GROUT AROUND CONDUIT.

1 - PHOTO
SCALE: N.T.S.

SCALE
10 5 0 10 20
FEET

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Designed: Z. MILES, P.E.
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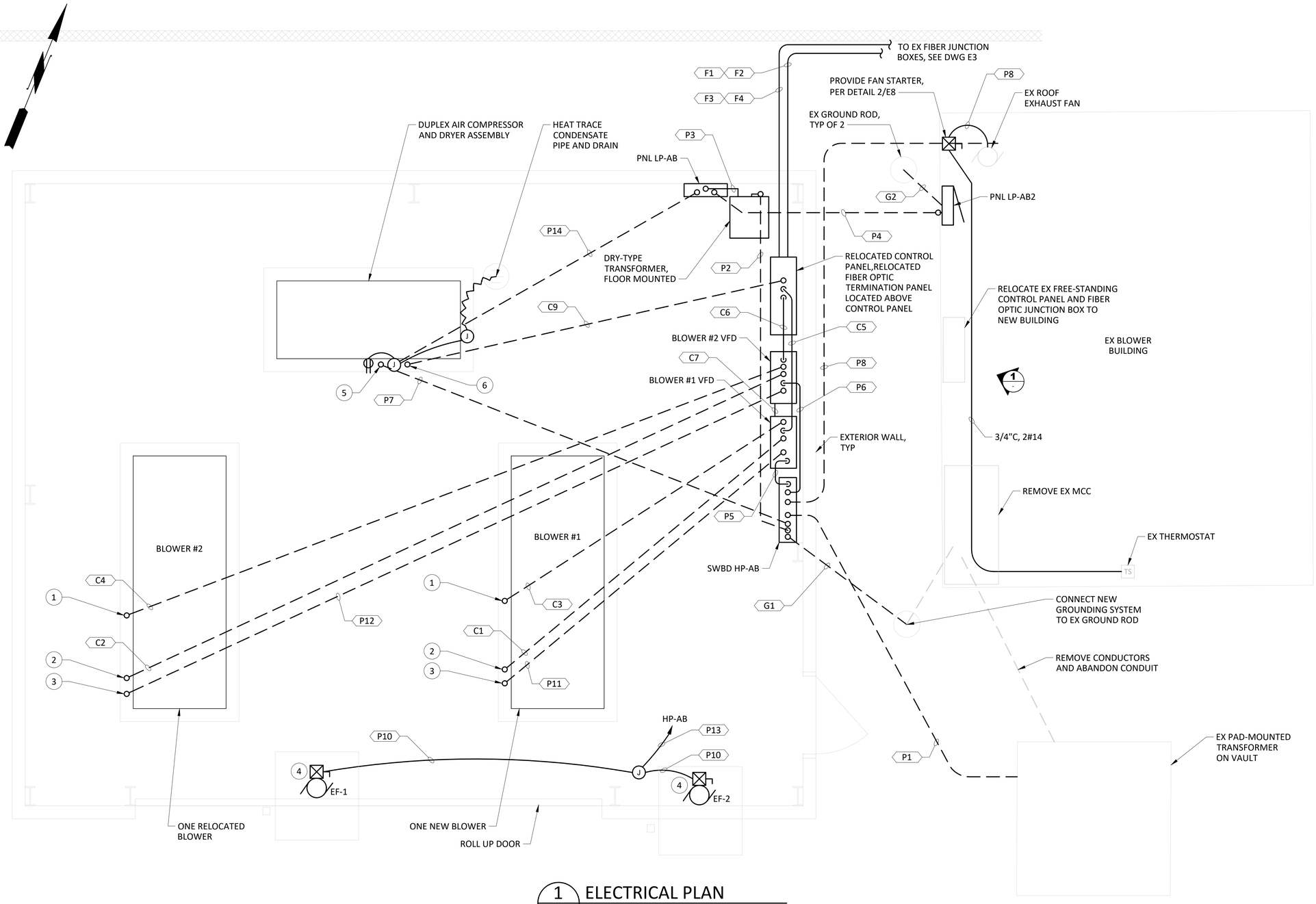
WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ELECTRICAL

ELECTRICAL PLAN

Drawing: E3
Sheet No.: 24
31 Of Total



1 / E3 ELECTRICAL PLAN
SCALE: 1/2" = 1'-0"

1 / - PHOTO
SCALE: NTS

CONSTRUCTION NOTES:

1. PROVIDE JUNCTION BOX AND CONNECT TO BEARING RTD ON INLET AND OUTLET OF EACH BLOWER.
2. PROVIDE JUNCTION BOX AND CONNECT TO VIBRATION SENSORS ON TOP OF BLOWER.
3. CONNECT TO MOTOR TERMINAL BOX WITH LFMC.
4. PROVIDE HVAC CONTROL WIRING TO THERMOSTAT IN CONDUIT PER DRAWING H4.
5. PROVIDE POWER CONNECTION TO TERMINAL BOX WITH LFMC.
6. PROVIDE CONTROL CONNECTION TO CONTROL PANEL WITH LFMC.

NO.	DATE	APRVD	REVISION

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BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ELECTRICAL

ELECTRICAL POWER PLAN

Drawing E4
Sheet No. 25 / 31 Of Total

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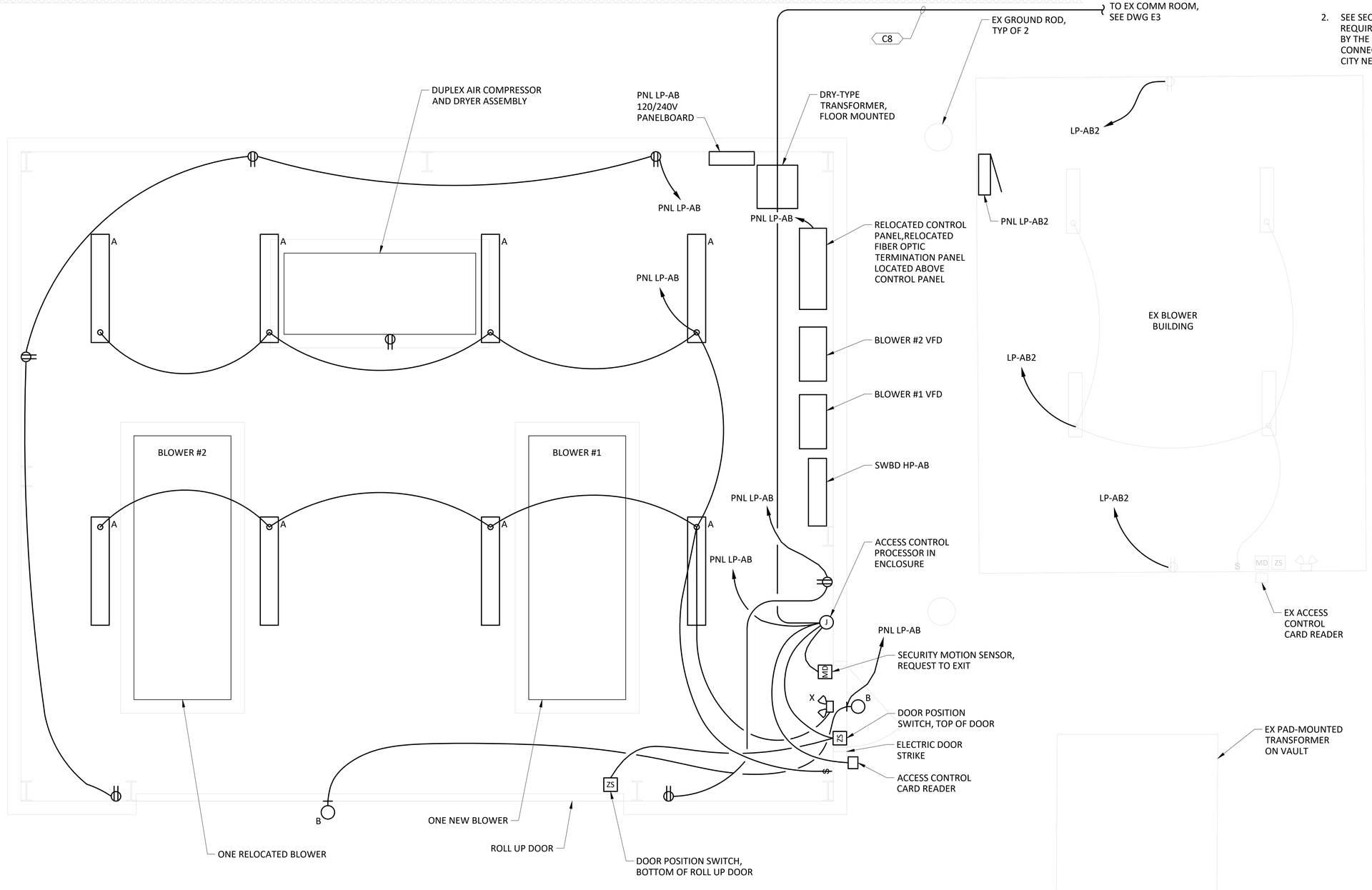
NOTES:

1. RECONNECT EXISTING LIGHTS AND RECEPTACLES IN EXISTING BLOWER BUILDING TO NEW PANEL LP-AB2.
2. SEE SECTION 28 16 00 FOR ACCESS CONTROL WIRING REQUIREMENTS. PROVIDE ALL WIRING AS REQUIRED BY THE DEVICES. COORDINATE WITH OWNER FOR CONNECTION OF NEW CONTROLLER WITH EXISTING CITY NETWORK. COORDINATE NEW IP ADDRESSING



1 / E3 ELECTRICAL PLAN

SCALE: 1/2" = 1'-0"

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID			CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD
	06-2024	JFG						

Designed J. GIBSON, P.E.
Drawn A. BRADLEY
Checked R. DORN, P.E.
Design Review Level

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6/1/2024

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ELECTRICAL

ELECTRICAL LIGHTING, RECEPTACLE AND ACCESS CONTROL PLAN

Drawing E5

Sheet No. 26 / 31 Of Total

Plot date: 5/31/2024 11:24 AM Plotted by: Anthony Bradley Last saved by: abradley Plot style: Everett-2016.stb Sheetset Name: Everett Sheetset 2016
File path\Filename: S:\CAD\EVERETT\23-10858 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_E5.DWG

CONDUIT SCHEDULE

TAG	SIZE	CONDUIT TYPE	WIRE	FROM	TO	NOTES
G1	3/4"	PVC	#6 G	SWBD HP-AB	GROUND ELECTRODES	EXISTING GROUND RODS
G2	3/4"	PVC	#6 G	PNL LP-AB2	GROUND ELECTRODES	EXISTING GROUND RODS
P1	4"	RGS	(3) 500KCMIL, 500KCMIL N	PAD-MOUNTED XFMR	SWBD HP-AB	
P2	3/4"	PVC	(2) #8, #10 G	SWBD HP-AB	XFMR AB	LFMC FOR XFMR CONNECTION
P3	1"	LFMC	(3) #4, #8 G	XFMR AB	PNL LP-AB	
P4	1"	PVC	(3) #8, #10 G	PNL LP-AB	PNL LP-AB2	RGS ABOVE GRADE
P5	4"	RGS	(3) 500KCMIL, #3 G	SWBD HP-AB	AS BLOWER #1 VFD	
P6	4"	RGS	(3) 500KCMIL, #3 G	SWBD HP-AB	AS BLOWER #2 VFD	
P7	2"	PVC	(3) #2, #8 G	SWBD HP-AB	AIR COMPRESSORS	
P8	1"	PVC	(3) #12, #12 G	SWBD HP-AB	OLD BLOWER BLDG EF-1	VIA STARTER, RGS ABOVE GRADE
P9						NOT USED
P10	3/4"	RGS	(3) #12, #12 G	FAN J-BOX	EF-1, EF-2	
P11	4"	PVC	(3) 400KCMIL, (2) #14, #3 G	BLOWER #1 VFD	BLOWER #1	
P12	4"	PVC	(3) 400KCMIL, (2) #14, #3 G	BLOWER #2 VFD	BLOWER #2	
P13	3/4"	RGS	(6) #12, #12 G	PNL LP-AB	FANS	
P14	3/4"	PVC	(2) #12, (2) #12N, #12G	PNL LP-AB	COMP RECEPT AND HEAT TRACE	
P15						
F1	2"	RGS	12 ST FO CABLE	FIBER J-BOX #1	RELOCATED FIBER TERM, CAB	REPLACE FO CABLE TO SOURCE
F2	2"	RGS	12 ST FO CABLE	FIBER J-BOX #1	RELOCATED FIBER TERM, CAB	REPLACE FO CABLE TO SOURCE
F3	2"	RGS	12 ST FO CABLE	FIBER J-BOX #2	RELOCATED FIBER TERM, CAB	REPLACE FO CABLE TO SOURCE
F4	2"	RGS	12 ST FO CABLE	FIBER J-BOX #2	RELOCATED FIBER TERM, CAB	REPLACE FO CABLE TO SOURCE
C1	3/4"	PVC	(2) TST (2)	BLOWER #1 VFD	BLOWER #1	BEARING RTDS
C2	3/4"	PVC	(2) TST (2)	BLOWER #2 VFD	BLOWER #2	BEARING RTDS
C3	3/4"	PVC	(2) TSP (1)	BLOWER #1 VFD	BLOWER #1	VIBRATION SENSORS
C4	3/4"	PVC	(2) TSP (1)	BLOWER #2 VFD	BLOWER #2	VIBRATION SENSORS
C5	1"	RGS	CAT 6	BLOWER #1 VFD	CONTROL PNL	ETHERNET
C6	1"	RGS	CAT 6	BLOWER #2 VFD	CONTROL PNL	ETHERNET
C7	3/4"	RGS	(4) #14	BLOWER #1 VFD	BLOWER #2 VFD	INTERLOCK
C8	1"	RGS	(2) CAT 6	SECURITY J-BOX	COMM RM	
C9	1"	PVC	(6) #14	CONTROL PNL	AIR COMPRESSOR	2 SPARE
C10						
C11						

LUMINAIRE SCHEDULE

TAG	DESCRIPTION	LUMENS	WATTS, MAX	MANUFACTURER / MODEL #
A	LED LOW BAY 48", STEEL HOUSING, ACRYLIC LENS, HIGH EFFICIENCY, 10% DIMMING, 4000K, 80CRI, WHITE	8000	58	LITHONIA UFIT L48, 8000LM, HEF MVOLT GZ10, 40K, 80CRI, WHITE
B	EXTERIOR WALL PACK, LED PHOTOCELL CONTROLLED	5000	40	LITHONIA TWX1 LED P2 50K MVOLT PE SSBTXD
D	EXIT LIGHT AND EMERGENCY EGRESS FIXTURE, TWO HEADS, LED, 90 MIN NICAD BATTERY, GREEN LETTERS SELF DIAGNOSTICS	200	4	LITHONIA LHQM LED G M6

SWBD HP-AB SCHEDULE

POLE NO.	C.B. AMP	C.B. POLES	SERVICE	LOAD KVA TOTAL	TYPE	A	B	C	TYPE	TOTAL	SERVICE	C.B. AMP	C.B. POLES	POLE NO.
1	400	3	BLOWER #1	66.5	M	68.17						20	3	2
3			VFD	66.5	M		68.17							4
5				66.5	M			68.17						6
7	400	3	BLOWER #2		M	1.4			M	0.95	EXHAUST FAN	30	3	8
9			VFD		M		1.4		M	0.95	EF-1			10
11					M			1.4	M	0.95				12
13	100	3	AIR COMPRESSOR SKID	4	M	5.92			S	1.92	PANEL LP-AB	50	2	14
15				4	M		5.92		S	1.92	VIA XFMR			16
17				4	M			4						18
19									M	0.95	EF-2	30	3	20
21									M	0.95				22
23									M	0.95				24
25									M	0.83	EF IN OLD BLOWER BLDG	30	3	26
27									M	0.83				28
29									M	0.83				30
31														32
33														34
35														36
37	30	3	SPD											38
39														40
41														42
CONNECTED LOAD PER PHASE						0.8	0.36							

LOAD SUMMARY	CONN KVA	DEMAND FACTOR	DEMAND KVA
TYPE "L": LIGHTING LOADS	1.30	125%	1.63
TYPE "C": CONTINUOUS LOADS	1.10	125%	1.38
TYPE "R": RECEPTACLES (FIRST 10KVA)	1.62	100%	1.62
TYPE "R": RECEPTACLES (OVER 10KVA)		50%	
TYPE "M": LARGEST MOTOR LOAD	199.50	125%	249.38
TYPE "M": OTHER MOTOR LOADS	17.34	100%	17.34
TYPE "N": NON-CONTINUOUS LOADS	5.01	100%	5.01
TYPE "S": SUB-FEED (INCLUDED IN LOADS ABOVE)			
TOTAL	225.87		276.35

DEMAND AMPS: 333

VOLTS: 277/480V, 3PH, 4W
MAIN C.B.: 600AF
400AT LSIG
BUS: 600Amp
POLES: 42
MOUNTING: SURFACE
AIC RATING 42,000

PANEL FEATURES: SPD

BRKR FEATURES

CONSTRUCTION NOTES:

1. BELDEN 9318, OR EQUAL.
2. BELDEN 9553, OR EQUAL.

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed: Z. MILES, P.E.
Drawn: J. LIRA
Checked: R. DORN, P.E.
Design Review Level

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ELECTRICAL

ELECTRICAL SCHEDULES

Drawing: E6
Sheet No. 27 / 31 Of Total

Plot date 5/31/2024 11:26 AM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
File path\Filename S:\CAD\EVERETT\23-10858 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_E6.DWG

PNL LP-AB SCHEDULE

POLE NO.	C.B. AMP	C.B. POLES	SERVICE	LOAD KVA TOTAL	TYPE	A	B	TYPE	TOTAL	SERVICE	C.B. AMP	C.B. POLES	POLE NO.
1	20	1	INTERIOR LIGHTS	0.5	L	1.6		C	1.1	CONTROL PANEL	20	1	2
3	20	1	RECEPTS	0.36	R		0.36				20	1	4
5	20	1	RECEPTS	0.72	R	0.72					20	1	6
7	20	1	EXTERIOR LIGHTS	0.36	R		0.36				20	1	8
9	20	1	ACCESS CONTROL	0.1	C	0.1					20	1	10
11	20	1	HEAT TRACE	0.3	N		0.3				20	1	12
13													14
15													16
17													18
19													20
21	30	2	SPD			0.8		S	0.8	PANEL LP-AB2	30	2	22
23							0.36	S	0.36	IN OLD BLOWER BUILDING			24
CONNECTED LOAD PER PHASE						53.63							

LOAD SUMMARY	CONN KVA	DEMAND FACTOR
TYPE "L": LIGHTING LOADS	1.30	125%
TYPE "C": CONTINUOUS LOADS	1.10	125%
TYPE "R": RECEPTACLES (FIRST 10KVA)	1.44	100%
TYPE "R": RECEPTACLES (OVER 10KVA)		50%
TYPE "M": LARGEST MOTOR LOAD		125%
TYPE "M": OTHER MOTOR LOADS		100%
TYPE "N": NON-CONTINUOUS LOADS		100%
TYPE "S": SUB-FEED (INCLUDED IN LOADS ABOVE)		
TOTAL	3.84	

VOLTS: 120/240V, 1PH, 3W
MAIN C.B.: 80Amp
BUS: 100Amp
POLES: 24
MOUNTING: SURFACE
AIC RATING 10,000
DEMAND AMPS 19

PANEL FEATURES: SPD

BRKR FEATURES

PNL LP-AB2 SCHEDULE

POLE NO.	C.B. AMP	C.B. POLES	SERVICE	LOAD KVA TOTAL	TYPE	A	B	C	TYPE	TOTAL	SERVICE	C.B. AMP	C.B. POLES	POLE NO.
1	20	1	LIGHTS	0.8	L	0.8						20	1	2
3	20	1	RECEPTS	0.36	R		0.36					20	1	4
5	20	1										20	1	6
7	20	1										20	1	8
9														10
11														12
CONNECTED LOAD PER PHASE						0.8	0.36							

LOAD SUMMARY	CONN KVA	DEMAND FACTOR	DEMAND KVA
TYPE "L": LIGHTING LOADS	0.8	125%	1.00
TYPE "C": CONTINUOUS LOADS		125%	
TYPE "R": RECEPTACLES (FIRST 10KVA)	0.36	100%	0.36
TYPE "R": RECEPTACLES (OVER 10KVA)		50%	
TYPE "M": LARGEST MOTOR LOAD		125%	
TYPE "M": OTHER MOTOR LOADS		100%	
TYPE "N": NON-CONTINUOUS LOADS		100%	
TYPE "S": SUB-FEED (INCLUDED IN LOADS ABOVE)			
TOTAL	1.16		1.36

VOLTS: 120/240V, 1PH, 3W
MAIN C.B.: 30Amp
BUS: 60Amp
POLES: 12
MOUNTING: SURFACE
AIC RATING 10,000
DEMAND AMPS 6

PANEL FEATURES

BRKR FEATURES

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed Z. MILES, P.E.
Drawn J. LIRA
Checked R. DORN, P.E.
Design Review Level

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

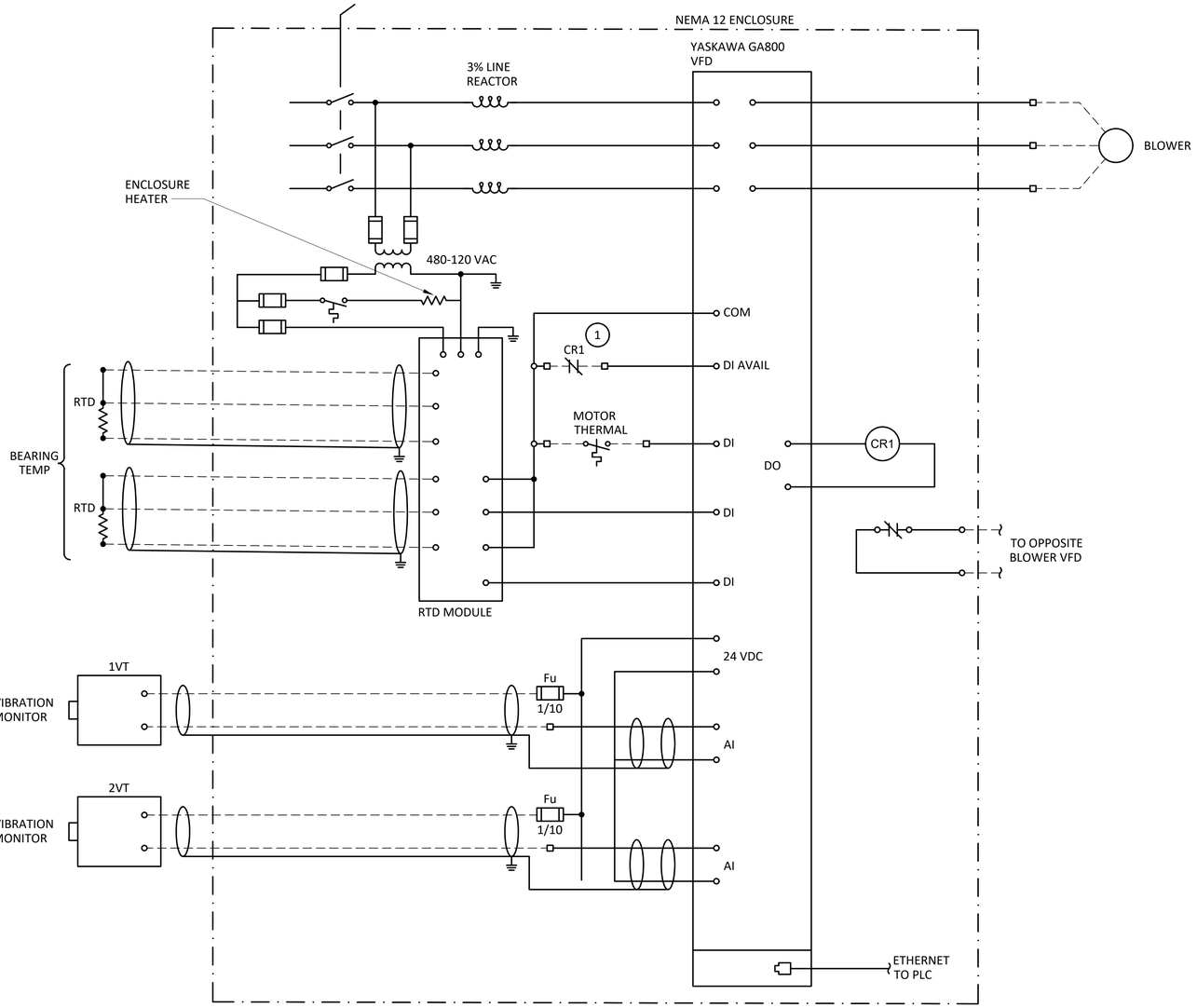
ELECTRICAL

ELECTRICAL PANEL SCHEDULES

Drawing E7

Sheet No. 28 / 31 Of Total

Plot date 5/31/2024 11:30 AM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
File path\Filename S:\CAD\EVERETT\23-10888 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_E7.DWG

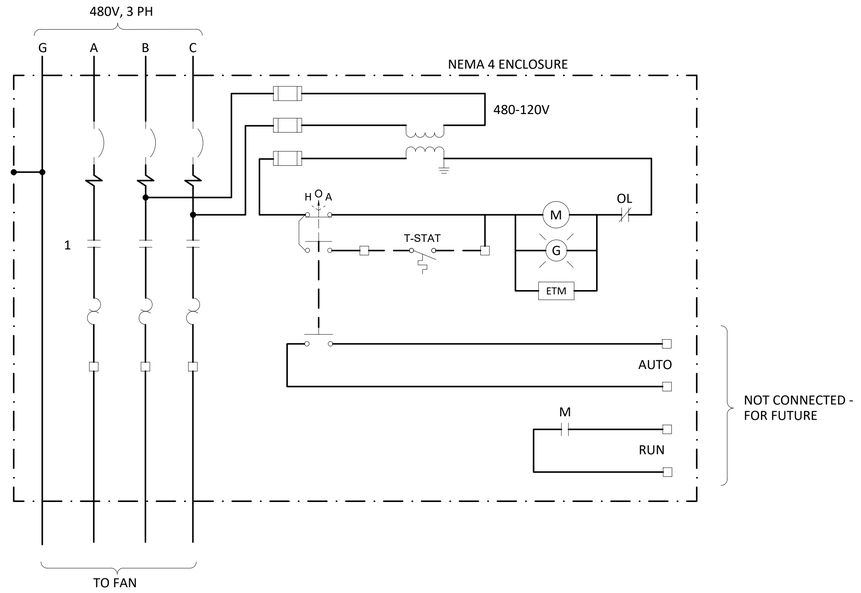


CONSTRUCTION NOTES:

1. RUN CONTACT FROM OTHER BLOWER VFD. INTERLOCK BLOWERS SO THAT ONLY ONE CAN RUN AT A TIME.

1 - BLOWER CONTROL DIAGRAM DETAIL (TYP OF 2)

SCALE: NTS



2 - EXHAUST FAN STARTER WIRING DIAGRAM DETAIL

SCALE: NTS

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed Z. MILES, P.E.
Drawn J. LIRA
Checked R. DORN, P.E.
Design Review Level

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5/31/2024

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

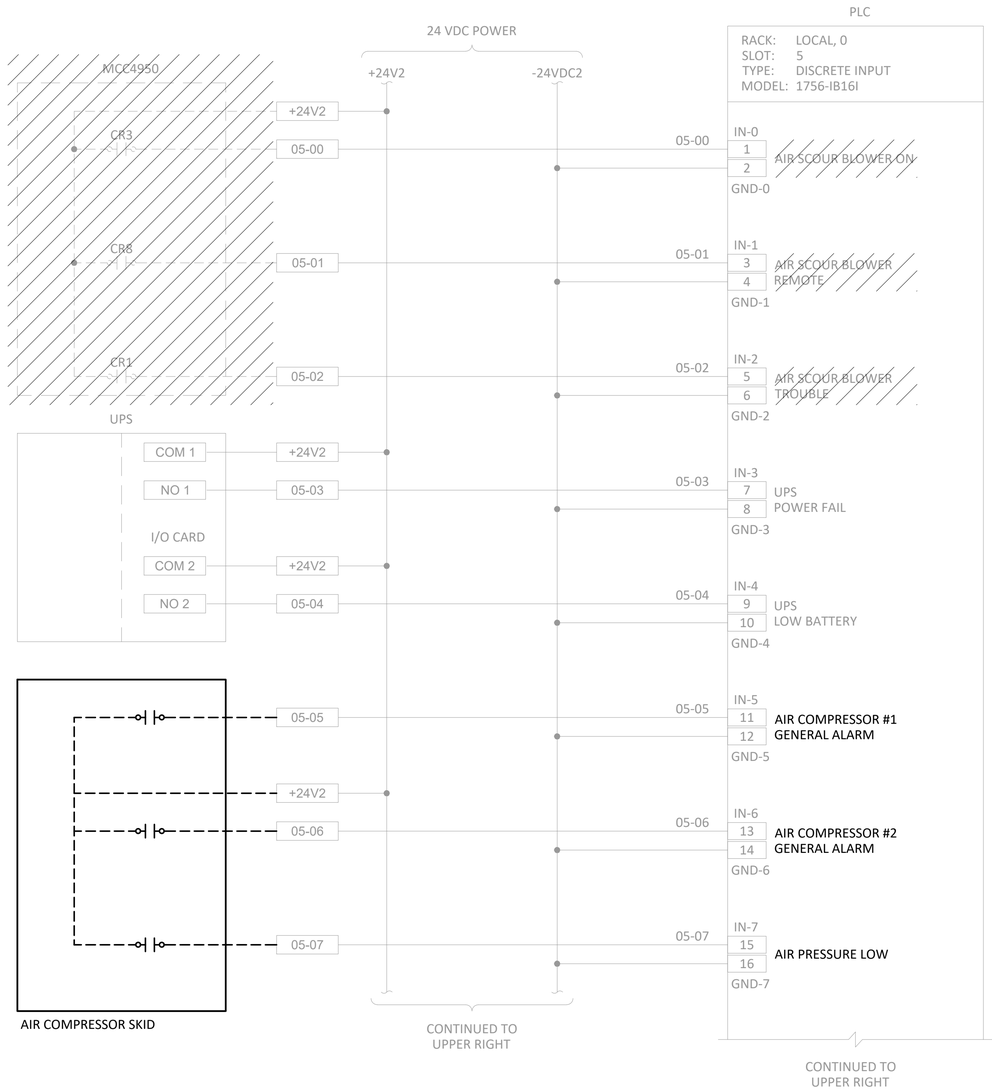
ELECTRICAL

ELECTRICAL MOTOR CONTROL DIAGRAMS

Drawing E8

Sheet No. 29 / 31 Of Total

Plot date: 5/31/2024 11:31 AM Plotted by: Anthony Bradley Last saved by: abradley Plot style: Everett-2016.ctb Sheetset Name: Everett Sheetset 2016
File path\Filename: S:\CAD\EVERETT\23-108\8 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\8813_E8.DWG



NOTES:

1. REMOVE EXISTING DISCRETE WIRING FROM BLOWER TO PLC. PROVIDE NEW ETHERNET COMMUNICATION FROM THE NEW VFD TO THE EXISTING ETHERNET SWITCH IN THE PLC CABINET.

1 / - AIR SCOUR BLOWER PLC WIRING

SCALE: NTS

NO.	DATE	APRVD	REVISION

PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed J. GIBSON, P.E.
Drawn A. BRADLEY
Checked R. DORN, P.E.
Design Review Level

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

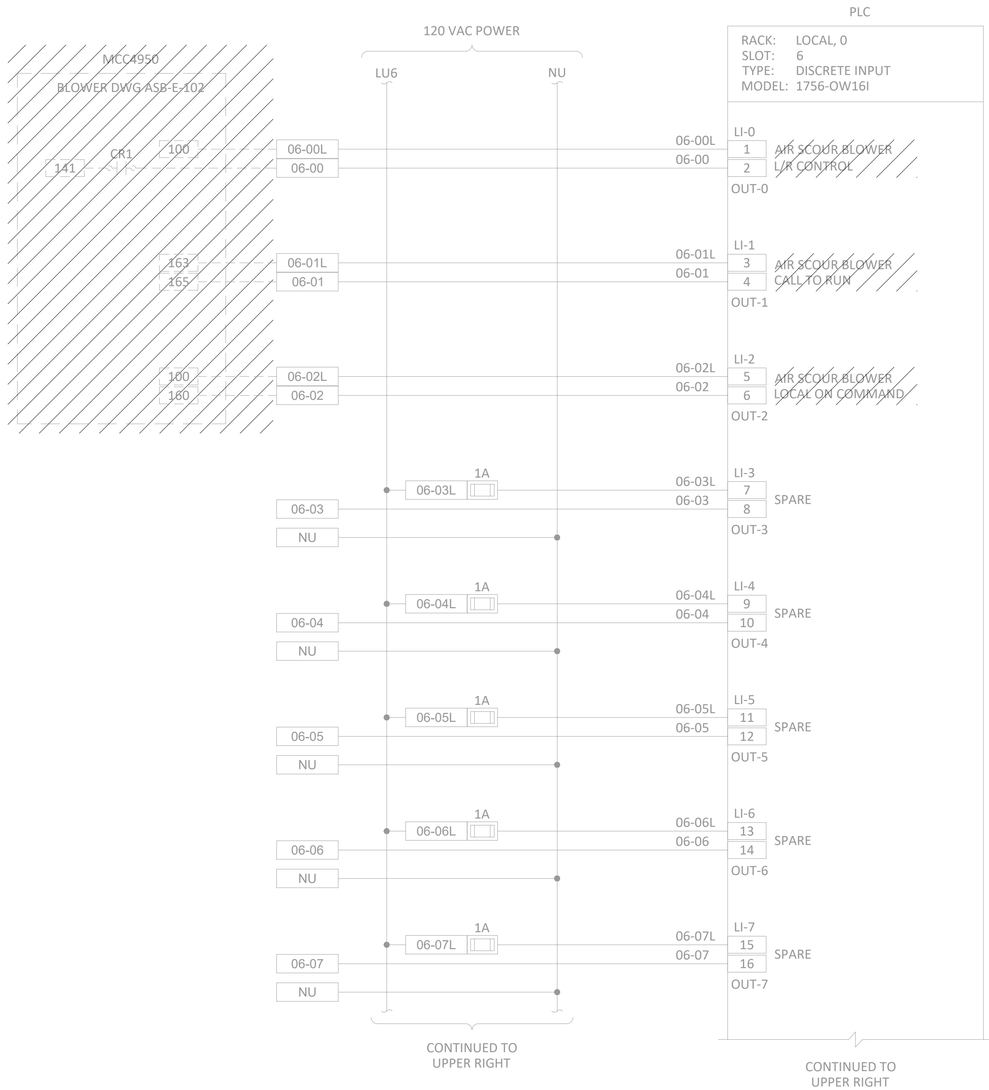
ELECTRICAL

ELECTRICAL WIRING DIAGRAM 1 OF 2

Drawing E9

Sheet No. 30 / 31 Of Total

Plot date 5/31/2024 11:32 AM Plotted by Anthony Bradley Last saved by abradley Plot style Everett-2016.stb Sheetset Name Everett Sheetset 2016
File path\Filename: S:\CAD\EVERETT\23-10838 WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_E9.DWG



NOTES:

1. REMOVE EXISTING DISCRETE WIRING FROM BLOWER TO PLC. PROVIDE NEW ETHERNET COMMUNICATION FROM THE NEW VFD TO THE EXISTING ETHERNET SWITCH IN THE PLC CABINET.

1 / - AIR SCOUR BLOWER PLC WIRING

SCALE: NTS

NO.	DATE	APRVD	REVISION
			PLANS ISSUED FOR

BID	06-2024	JFG	CONST			RECORD		
ACTION	DATE	APRVD	ACTION	DATE	APRVD	ACTION	DATE	APRVD

Designed J. GIBSON, P.E.
Drawn A. BRADLEY
Checked R. DORN, P.E.
Design Review Level

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6/1/2024

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WFP AIR SCOUR BLOWER BUILDING REPLACEMENT

ELECTRICAL

ELECTRICAL WIRING DIAGRAM 2 OF 2

Drawing E10

Sheet No. 31 / 31 Of Total

Plot date 5/31/2024 11:33 AM Plotted by Anthony Bradley Last saved by abradley Plot style Everett 2016.stb Sheetset Name Everett Sheetset 2016
Filepath\Filename S:\CAD\EVERETT\23-108SB WATER TRT PLANT BLOWER BLDG\DESIGN\DWGS\3813_E10.DWG