Elizabeth Comfort
Finance Director

Department of Finance
Public Services Building
2051 Kaen Road, Suite 490 | Oregon City, OR 97045

Board of County Commissioners
Clackamas County

Approval of a Public Improvement Contract with Apex Mechanical, LLC, For the Public Safety Training Center Make-Up Air Unit and Exhaust Unit Replacement project. Contract Value is $643,900. Funding is through budgeted County General Fund.

Purpose/Outcome	The contract will provide the replacement of the existing MAU and exhaust system serving the public shooting range and the Law Enforcement range
Dollar Amount and Fiscal Impact	$643,900.00. This project is included on the FY 22/23 budget for the Replacement of outdated Make-up air unit and exhaust fan.
Funding Source	The funds are coming from budget County General Funds through the Capital Improvement fund. Contract value is $643,900.
Duration	Contract Execution through June 30, 2023
Previous Board Action/Review	*Issues date:* 8/2/2022
Strategic Plan Alignment	*How does this item align with your department's Strategic Business Plan goals?* This project aligns with the department's Strategic Business plan goals by providing PSTC with a product that effectively delivers services to their customers, public and L.E. *How does this item align with the County's Performance Clackamas goals?* This project meets several Performance Clackamas goals, namely,(A) Growing a Vibrant Economy,(B) Ensuring safe, healthy and secure communities, and (C) Building Public Trust through Good Government. This will be accomplished by eliminating old inefficient equipment and investing into a more efficient system that will introduce a/c. This will create a safer and more comfortable shooting range experience for the Public as well as Law Enforcement.
Counsel Review	Counsel Date: July 11, 2022 Counsel Initials: AN
Procurement Review	Was this project processed through Procurement? Yes.
Contact Person	Chuck Kerns, Building Systems Coordinator 503-557-6416
Contract No.	6771

Background:
The Public Safety Training Center (PSTC) -- a 22,300 sq. foot facility. The equipment that presently feeds both ranges is 25 years old and was rated for 15 years. It runs at 100% anytime it's in operation. The Air-handler is 100% outside air and uses gas heat and has no cooling. The new equipment and controls will drastically cut down on energy use. By separating the ranges, allowing the air-handler to speed up or slow down depending on number of ranges used, along with less electricity and less gas. The other addition will be to introduce DX (direct expansion) cooling. The system will be fully automated with Facilities Management being able to monitor it remotely, allowing for faster response time for maintenance and troubleshooting.

Procurement Process:
This project was advertised in accordance with ORS and LCRB Rules on May 18, 2022. Proposals were publicly opened on June 23, 2022. The County received two (2) responses: Apex Mechanical, $643,900.00 and Delta Connects, $763,336.00. After review of the bids, Apex Mechanical, LLC, was determined to be the lowest responsive bidder.

Recommendation:
Staff respectfully recommends that the Board approve and sign this Public Improvement contract with Apex Mechanical, LLC, for the Public Safety Training Center MAU and Exhaust Replacement project.

Sincerely,

Elizabeth Comfort

Elizabeth Comfort
Finance Director

Placed on the BCC Agenda _____ by Procurement

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT
Contract #6771

This Public Improvement Contract (the "Contract"), is made by and between the Clackamas County, a political subdivision of the State of Oregon, hereinafter called "Owner," and **Apex Mechanical, LLC.**, hereinafter called the "Contractor" (collectively the "Parties"), shall become effective on the date this Contract has been signed by all the Parties and all County approvals have been obtained, whichever is later.

Project Name: BID#2022-56 Public Safety Training Center MAU and Exhaust Replacement

1. Contract Price, Contract Documents and Work.
The Contractor, in consideration of the sum of **Six Hundred Forty-Three Thousand Nine Hundred Dollars ($643,900.00)** (the "Contract Price"), to be paid to the Contractor by Owner in the manner and at the time hereinafter provided, and subject to the terms and conditions provided for in the Instructions to Bidders and other Contract Documents (as defined in the Clackamas County General Conditions for Public Improvement Contracts (10/13/2021) ("General Conditions") referenced within the Instructions to Bidders), all of which are incorporated herein by reference, hereby agrees to perform all Work described and reasonably inferred from the Contract Documents. The Contract Price is the amount contemplated by the Base Bid as indicated in the accepted Bid.

Also, the following documents are incorporated by reference in this Contract and made a part hereof:

- Notice of Contract Opportunity
- Supplemental Instructions to Bidders
- Bid Form
- Performance Bond and Payment Bond
- Supplemental General Conditions
- Payroll and Certified Statement Form
- Addenda 1
- Instructions to Bidders
- Bid Bond
- Public Improvement Contract Form
- Clackamas County General Conditions
- Prevailing Wage Rates
- Plans, Specifications and Drawings

2. Representatives.
Contractor has named Seth Wilson as its Authorized Representative to act on its behalf. Owner designates, or shall designate, its Authorized Representative as indicted below (check one):

☒ Unless otherwise specified in the Contract Documents, the Owner designates Chuck Kerns as its Authorized Representative in the administration of this Contract. The above-named individual shall be the initial point of contact for matters related to Contract performance, payment, authorization, and to carry out the responsibilities of the Owner.

☐ Name of Owner's Authorized Representative shall be submitted by Owner in a separate writing.

3. Key Persons.
The Contractor's personnel identified below shall be considered Key Persons and shall not be replaced during the project without the written permission of Owner, which shall not be unreasonably withheld. If the Contractor intends to substitute personnel, a request must be given to Owner at least 30 days prior to the intended time of substitution. When replacements have been approved by Owner, the Contractor shall provide a transition period of at least 10 working days during which the original and replacement personnel shall be working on the project concurrently. Once a replacement for any of these staff members is authorized, further

replacement shall not occur without the written permission of Owner. The Contractor's project staff shall consist of the following personnel:

Project Executive: Seth Wilson shall be the Contractor's project executive, and will provide oversight and guidance throughout the project term.

Project Manager: Dalton Wagener shall be the Contractor's project manager and will participate in all meetings throughout the project term.

Job Superintendent: Carl Kangas shall be the Contractor's on-site job superintendent throughout the project term.

Project Engineer: Samantha Granger shall be the Contractor's project engineer, providing assistance to the project manager, and subcontractor and supplier coordination throughout the project term.

4. Contract Dates.
COMMENCEMENT DATE: Upon Issuance of Notice to Proceed
SUBSTANTIAL COMPLETION DATE: January 1, 2023
FINAL COMPLETION DATE: June 30, 2023

Time is of the essence for this Contract. It is imperative that the Work in this Contract reach Substantial Completion and Final Completion by the above specified dates.

5. Insurance Certificates.
In accordance with Section G.3.5 of the General Conditions, Contractor shall furnish proof of the required insurance naming Clackamas County as an additional insured. Insurance certificates may be returned with the signed Contract or may be emailed to Procurement@clackamas.us.

6. Tax Compliance.
Contractor must, throughout the duration of this Contract and any extensions, comply with all tax laws of this state and all applicable tax laws of any political subdivision of this state. Any violation of this section shall constitute a material breach of this Contract. Further, any violation of Contractor's warranty in this Contract that Contractor has complied with the tax laws of this state and the applicable tax laws of any political subdivision of this state also shall constitute a material breach of this Contract. Any violation shall entitle County to terminate this Contract, to pursue and recover any and all damages that arise from the breach and the termination of this Contract, and to pursue any or all of the remedies available under this Contract, at law, or in equity, including but not limited to: (A) Termination of this Contract, in whole or in part; (B) Exercise of the right of setoff, and withholding of amounts otherwise due and owing to Contractor, in an amount equal to County's setoff right, without penalty; and (C) Initiation of an action or proceeding for damages, specific performance, declaratory or injunctive relief. County shall be entitled to recover any and all damages suffered as the result of Contractor's breach of this Contract, including but not limited to direct, indirect, incidental and consequential damages, costs of cure, and costs incurred in securing replacement performance. These remedies are cumulative to the extent the remedies are not inconsistent, and County may pursue any remedy or remedies singly, collectively, successively, or in any order whatsoever.

The Contractor represents and warrants that, for a period of no fewer than six calendar years preceding the effective date of this Contract, has faithfully complied with: (A) All tax laws of this state, including but not limited to ORS 305.620 and ORS chapters 316, 317, and 318; (B) Any tax provisions imposed by a political subdivision of this state that applied to Contractor, to Contractor's property, operations, receipts, or income, or to Contractor's performance of or compensation for any work performed by Contractor; (C) Any tax

provisions imposed by a political subdivision of this state that applied to Contractor, or to goods, services, or property, whether tangible or intangible, provided by Contractor; and (D) Any rules, regulations, charter provisions, or ordinances that implemented or enforced any of the foregoing tax laws or provisions.

7. Confidential Information.
Contractor acknowledges that it and its employees or agents may, in the course of performing their responsibilities under this Contract, be exposed to or acquire information that is confidential to Owner. Any and all information of any form obtained by Contractor or its employees or agents in the performance of this Contract shall be deemed confidential information of Owner ("Confidential Information"). Contractor agrees to hold Confidential Information in strict confidence, using at least the same degree of care that Contractor uses in maintaining the confidentiality of its own confidential information, and not to copy, reproduce, sell, assign, license, market, transfer or otherwise dispose of, give, or disclose Confidential Information to third parties or use Confidential Information for any purpose unless specifically authorized in writing under this Contract.

8. Counterparts.
This Contract may be executed in several counterparts, all of which when taken together shall constitute an agreement binding on all Parties, notwithstanding that all Parties are not signatories to the same counterpart. Each copy of the Contract so executed shall constitute an original.

9. Integration.
All provisions of state law required to be part of this Contract, whether listed in the General or Special Conditions or otherwise, are hereby integrated and adopted herein. Contractor acknowledges the obligations thereunder and that failure to comply with such terms is a material breach of this Contract.

The Contract Documents constitute the entire agreement between the parties. There are no other understandings, agreements or representations, oral or written, not specified herein regarding this Contract. Contractor, by the signature below of its authorized representative, hereby acknowledges that it has read this Contract, understands it, and agrees to be bound by its terms and conditions.

10. Compliance with Applicable Law. Contractor shall comply with all federal, state, county, and local laws, ordinances, and regulations applicable to the Work to be done under this Contract including, but not limited to, compliance with the prohibitions set forth in ORS 652.220, compliance of which is a material element of this Contract and failure to comply is a material breach that entitles County to exercise any rights and remedies available under this Contract including, but not limited to, termination for default.

11. Responsibility for Taxes. Contractor is solely responsible for payment of any federal, state, or local taxes required as a result of the Contract or the Work including, but not limited, to payment of the corporate activity tax imposed under enrolled HB 3427 (2019 Oregon regular legislative session). Contractor may not include its federal, state, or local tax obligations as part of the cost to perform the Work.

In witness whereof, Clackamas County executes this Contract and the Contractor does execute the same as of the day and year first above written.

Contractor DATA:
Apex Mechanical, LLC.
1507 SE Eaton Blvd
Battle Ground, WA 98604

Contractor CCB # 217047 Expiration Date: 9/12/2023
Oregon Business Registry # 1305246-97 Entity Type: FLLC State of Formation: Washington

Payment information will be reported to the IRS under the name and taxpayer ID# provided by the Contractor. Information must be provided prior to contract approval. Information not matching IRS records could subject Contractor to 28 percent backup withholding.

Apex Mechanical, LLC

Authorized Signature — Date: 7/5/22

Seth Wilson — Member

Name / Title Printed

Clackamas County

Chair — Date

Recording Secretary

APPROVED AS TO FORM — 07/12/2022

County Counsel

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT OPPORTUNITY

Table of Contents

CLACKAMAS COUNTY
NOTICE OF PUBLIC IMPROVEMENT CONTRACT OPPORTUNITY

INVITATION TO BID #2022-56
Public Safety Training Center MAU and Exhaust Replacement
May 18, 2022

Clackamas County ("County") through its Board of County Commissioners is accepting sealed bids for the **Public Safety Training Center MAU and Exhaust Replacement** Project until **June 23, 2022, 2:00 PM,** Pacific Time, ("Bid Closing") at the following location:

DELIVER BIDS TO: Clackamas County Procurement Division via email to procurement@clackamas.us

Bidding Documents can be downloaded from the state of Oregon procurement website ("OregonBuys") at the following address: https://oregonbuys.gov/bso/view/login/login.xhtml, Document No.S-C01010-000003215.
Prospective Bidders will need to sign in to download the information and that information will be accumulated for a Plan Holder's List. Prospective Bidders are responsible for obtaining any Addenda from Website listed above.

Engineers Estimate: $650,000.00

Contact Information
Procurement Process and Technical Questions: Tralee Whitley at TWhitley@clackamas.us.

A **Mandatory Pre-Bid Conference** will be conducted on June 1, 2022 at 10:00 AM. Bidders shall meet with County representatives at the **Public Safety Training Center** located at **12700 SE 82nd Ave, Clackamas, Oregon** for that purpose. Attendance will be documented through a sign-in sheet prepared by the County representative. Prime bidders who arrive more than ten (10) minutes after the start time of the meeting (as stated in the solicitation and by the County's watch) or after the discussion portion of the meeting (whichever comes first) shall not be permitted to sign in and will not be permitted to submit a bid on the project.

Bids will be opened and publicly read aloud at the above Delivery address after the Bid Closing. Bid results will also be posted to the OregonBuys listing shortly after the opening.

Prevailing Wage
Prevailing Wage Rates requirements apply to this Project because the maximum compensation for all Owner-contracted Work is more than $50,000. Contractor and all subcontractors shall comply with the provisions of ORS 279C.800 through 279C.870, relative to Prevailing Wage Rates. The Bureau of Labor and Industries (BOLI) wage rates and requirements set forth in the following BOLI booklet (and any listed amendments to that booklet), which are incorporated herein by reference, apply to the Work authorized under this Agreement:

PREVAILING WAGE RATES for Public Works Contracts in Oregon, January 1, 2022, as amended on April 1, 2022 which can be downloaded at the following web address:
http://www.oregon.gov/boli/WHD/PWR/Pages/pwr_state.aspx
The Work will take place in Clackamas County, Oregon.

Clackamas County encourages bids from Minority, Women, and Emerging Small Businesses.

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

INSTRUCTIONS TO BIDDERS

Clackamas County Local Contract Review Board Rules ("LCRB Rules") govern this procurement process. LCRB Rules may be found at: http://www.clackamas.us/code/documents/appendixc.pdf. The Instructions to Bidders is applicable to the procurement process for Clackamas County, or any component unit thereof identified on the Notice of Public Improvement Contract Opportunity, herein after referred to as the "Owner."

Article 1. Scope of Work

The work contemplated under this contract with the Owner, includes all labor, materials, transportation, equipment and services necessary for, and reasonably incidental to, the completion of all construction work in connection with the project described in the Project Manual which includes, but is not necessarily limited to, the Notice of Public Improvement Contract Opportunity, Instructions to Bidders, Supplemental Instructions to Bidders, Bid Form, Bid Bond, Public Improvement Contract Form, Performance Bond, Payment Bond, Clackamas County General Conditions for Public Improvement Contracts (10/13/2021), Supplemental General Conditions, and Plans, Specifications and Drawings.

Article 2. Examination of Site and Conditions

Before making a Bid, the Bidder shall examine the site of the work and ascertain all the physical conditions in relation thereto. The Bidder shall also make a careful examination of the Project Manual including the plans, specifications, and drawings and other contract documents, and shall be fully informed as to the quality and quantity of materials and the sources of supply of the materials. Failure to take these steps will not release the successful Bidder from entering into the contract nor excuse the Bidder from performing the work in strict accordance with the terms of the contract at the price established by the Bid.

The Owner will not be responsible for any loss or for any unanticipated costs, which may be suffered by the successful Bidder, as a result of such Bidder's failure to be fully informed in advance with regard to all conditions pertaining to the work and the character of the work required, including site conditions. No statement made by an elected official, officer, agent, or employee of the Owner in relation to the physical or other conditions pertaining to the site of the work will be binding on the Owner, unless covered by the Project Manual or an Addendum.

Article 3. Interpretation of Project Manual and Approval of Materials Equal to Those Provided in the Specifications

If any Bidder contemplating submitting a Bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or forms of contract documents, or detects discrepancies or omissions, such Bidder may submit to the Architect (read "Engineer" throughout in lieu of Architect as appropriate) a written request for an interpretation thereof at least ten (10) calendar days prior to the date set for the Bid Closing.

When a prospective Bidder seeks approval of a particular manufacturer's material, process or item of equal value, utility or merit other than that designated by the Architect in the Project Manual, the Bidder may submit to the Architect a written request for approval of such substitute at least ten (10) calendar days prior to the date set for the Bid Closing. The prospective Bidder submitting the request will be responsible for its prompt delivery.

Requests of approval for a substitution from that specified shall be accompanied by samples, records of performance, certified copies of tests by

impartial and recognized laboratories, and such other information as the Architect may request.

To establish a basis of quality, certain processes, types of machinery and equipment or kinds of materials may be specified in the Project Manual either by description of process or by designating a manufacturer by name and referring to a brand or product designation or by specifying a kind of material. Whenever a process is designated or a manufacturer's name, brand or item designation is given, or whenever a process or material covered by patent is designated or described, it shall be understood that the words "or approved equal" follow such name, designation or description, whether in fact they do so or not.

Any interpretation of the Project Manual or approval of manufacturer's material will be made only by an Addendum duly issued. All Addenda will be posted to the OregonBuys listing and will become a part of the Project Manual. The Owner will not be responsible for any other explanation or interpretation of the Project Manual nor for any other approval of a particular manufacturer's process or item for any Bidder.

When the Architect approves a substitution by Addendum, it is with the understanding that the Contractor guarantees the substituted article or material to be equal or better than the one specified.

Article 4. Security to Be Furnished by Each Bidder

Each Bid must be accompanied by either 1) a cashier's check or a certified check drawn on a bank authorized to do business in the State of Oregon, or 2) a Bid bond described hereinafter, executed in favor of the Owner, for an amount equal to ten percent (10%) of the total amount Bid as a guarantee that, if awarded the contract, the Bidder will execute the contract and provide a performance bond and payment bond as required. The successful Bidder's check or Bid bond will be retained until the Bidder has entered into a contract satisfactory to Owner and furnished a one hundred percent (100%) performance bond and one hundred percent (100%) payment bond. The Owner reserves the right to hold the Bid security as described in Article 10 hereof. Should the successful Bidder fail to execute and deliver the contract as provided for in Article 12 hereof, including a satisfactory performance bond and payment bond within twenty (20) calendar days after the Bid has been accepted by the Owner, then the contract award made to such Bidder may be considered canceled and the Bid security may be forfeited as liquidated damages at the option of the Owner. The date of the acceptance of the Bid and the award of the contract as contemplated by the Project Manual shall mean the date of acceptance specified in the Notice of Intent to Award.

Article 5.Execution of Bid Bond

Should the Bidder elect to utilize a Bid bond as described in Article 4 in order to satisfy the Bid security requirements, such form must be completed in the following manner:

A. Bid bonds must be executed on the County forms, which will be provided to all prospective Bidders by the Owner.

B. The Bid bond shall be executed on behalf of a bonding company licensed to do business in the State of Oregon.

C. In the case of a sole individual, the bond need only be executed as principal by the sole individual. In the case of a partnership, the bond must be executed by at least one of the partners. In the case of a corporation, the bond must be executed by stating the official name of the corporation under which is placed the signature of an officer authorized to sign on behalf of the corporation followed by such person's official capacity, such as president, etc. The corporation seal should then be affixed to the bond.

D. The name of the surety must be stated in the execution over the signature of its duly authorized attorney-in-fact and accompanied by the seal of the surety corporation.

Article 6. Execution of the Bid Form

Each Bid shall be made in accordance with: (i) the sample Bid Form accompanying these instructions; (ii) the appropriate signatures for a sole individual, partnership, corporation or limited liability corporation shall be added as noted in Article 5C above; (iii) numbers pertaining to base Bids shall be stated both in writing and in figures; and (iv) the Bidder's address shall be typed or printed.

The Bid Form relates to Bids on a specific Project Manual. Only the amounts and information asked for on the Bid Form furnished will be considered as the Bid. Each Bidder shall Bid upon the work exactly as specified and provided in the Bid Form. The Bidder shall include in the Bid a sum to cover the cost of all items contemplated by the Contract. The Bidder shall Bid upon all alternates that may be indicated on the Bid Form. When Bidding on an alternate for which there is no charge, the Bidder shall write the words "No Charge" in the space provided on the Bid Form. If one or more alternates are shown on the Bid Form, the Bidder shall indicate whether each is "add" or "deduct."

Article 7. Prohibition of Alterations to Bid

Bids that are incomplete, or contain ambiguities or have differing conditions required by the Bidder, including requested changes or exceptions to the Public Improvement Contract form or other portions of the Project Manual, may be rejected in Owner's sole and absolute discretion.

Article 8. Submission of Bid

Each Bid shall be sealed in an envelope, properly addressed to the Owner, showing on the outside of the envelope the name of the Bidder and the name of the project. Bids will be received at the time and place stated in the Notice of Public Improvement Contract Opportunity.

Article 9. Bid Closing and Opening of Bids

All Bids must be received by the Owner at the place and time set for the Bid Closing. Any Bids received after the scheduled Bid Closing time for receipt of Bids will be rejected.

At the time of opening and reading of Bids, each Bid received will be publicly opened and read aloud, irrespective of any irregularities or informalities in such Bids.

Generally, Bid results will be posted to the OregonBuys Website within a couple hours of the opening.

Article 10. Acceptance or Rejection of Bids by Owner

Unless all Bids are rejected, the Owner will award a contract based on the lowest responsive Bid from a responsible Bidder. If that Bidder does not execute the contract, it will be awarded to the next lowest responsible Bidder or Bidders in succession.

The Owner reserves the right to reject all Bids and to waive minor informalities. The procedures for contract awards shall be in compliance with the provisions of the LCRB Rules in effect at that time.

The Owner reserves the right to hold the Bid and Bid security of the three lowest Bidders for a period of thirty (30) calendar days from and after the time of Bid opening pending award of the contract. Following award of the contract the Bid security of the three lowest Bidders may be held twenty (20) calendar days pending execution of the contract. All other Bids will be rejected and Bid security will be returned.

In determining the lowest Bidder, the Owner reserves the right to take into consideration any or all authorized base Bids as well as alternates or combinations indicated in the Bid Form.

If no Bid has been accepted within thirty (30) calendar days after the opening of the Bids, each of the three lowest Bidders may withdraw the Bid submitted and request the return of the Bid security.

Article 11. Withdrawal of Bid

At any time prior to the Bid Closing, a Bidder may withdraw its Bid. This will not preclude the

submission of another Bid by such Bidder prior to the time set for the Bid Closing.

After the time set for the Bid Closing, no Bidder will be permitted to withdraw its Bid within the time frames specified in Article 10 for award and execution, except as provided for in that Article.

Article 12. Execution of Contract, Performance Bond and Payment Bond

The Owner will provide the successful Bidder with contract forms within seven (7) calendar days after the completion of the award protest period. The Bidder is required to execute the contract forms as provided, including a performance bond and a payment bond from a surety company licensed to do surety business in the State of Oregon, within seven (7) calendar days after receipt of the contract forms. The contract forms shall be delivered to the Owner in the number called for and to the location as instructed by the Owner.

Article 13. Recyclable Products

Contractors will use recyclable products to the maximum extent economically feasible in the performance of the Contract.

Article 14. Clarification or Protest of the Solicitation Document or Specifications

Any request for clarification or protest of the solicitation document or specifications must be submitted in the manner provided for in the applicable section of the LCRB Rules to the Procurement Representative referenced in the Notice of Public Improvement Contract Opportunity.

A protest of the Solicitation Document must be received within seven (7) business days of the issuance of the Bid or within three (3) business days of issuance of an addendum.

Requests for clarification may be submitted no less than five (5) business days prior to the Bid Closing Date.

Article 15. Protest of Intent to Award

Owner will name the apparent successful Bidder in a "Notice of Intent to Award" letter. Identification of the apparent successful Bidder is procedural only and creates no right in the named Bidder to the award of the contract. Competing Bidders will be notified by publication of the Notice of Intent to Award on the OregonBuys Website of the selection of the apparent successful Bidder(s) and Bidders shall be given seven (7) calendar days from the date on the "Notice of Intent to Award" letter to review the file at the Procurement Division office and file a written protest of award, pursuant to C-049-0450. Any award protest must be in writing and must be delivered by hand delivery or mail to the Procurement Division Director at: Procurement Division, 2051 Kaen Road, Oregon City, OR 97045.

Article 16. Disclosure of First-Tier Subcontractors

Within two (2) working hours after the Bid Closing, all Bidders shall submit to the County a disclosure form identifying any first-tier subcontractors (those entities that would be contracting directly with the prime contractor) that will be furnishing labor and materials on the contract, if awarded, whose subcontract value would be equal to or greater than: (a) Five percent (5%) of the total contract price, but at least $15,000; or (b) $350,000, regardless of the percentage of the total contract price.

Disclosures may be submitted with the Bid or may be hand delivered to the Bid Closing address or emailed to procurement@clackamas.us.

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

Project Name BID#2022-56 Public Safety Training Center MAU and Exhaust Replacement

The following modify the Clackamas County "Instructions to Bidders" for this Project. Where a portion of the Instructions to Bidders has been modified by these Supplemental Instructions to Bidders, the unaltered portions shall remain in effect.

1. **Mandatory Pre-Bid Conference** will be conducted on **June 1, 2022 at 10:00 AM**. Bidders shall meet with County representatives at the Public Safety Training Center located at 12700 SE 82nd Ave, Clackamas, Oregon for that purpose. Attendance will be documented through a sign-in sheet prepared by the County representative. Prime bidders who arrive more than ten (10) minutes after the start time of the meeting (as stated in the solicitation and by the County's watch) or after the discussion portion of the meeting (whichever comes first) shall not be permitted to sign in and will not be permitted to submit a bid on the project.

2. **Electronic Submissions:** The County is requiring all bids for this project be electronically submitted. Complete Bids (including all attachments) must be received by the closing time and date 2:00 p.m. Pacific Time, June 23, 2022. The Bid must be emailed to the following address: **Procurement@clackamas.us. The email subject line must read "Bid for #2022-56 Public Safety Training Center MAU and Exhaust Replacement project."** Upon receiving of the bid, the County will send bidders an email confirmation acknowledging receipt. Bids delayed or lost by email system filtering or failures may be considered at Clackamas County's sole and absolute discretion.

Bids will be publicly read aloud via the computer application, Zoom. Bidders will be allowed to video conference or listen by phone to the bid results. The projects Zoom meeting can be accessed via the information below:

ZOOM LINKS
Join Zoom Meeting
https://clackamascounty.zoom.us/j/82123160759

Meeting ID: 821 2316 0759
One tap mobile
+13462487799,,82123160759# US (Houston)
+14086380968,,82123160759# US (San Jose)

Dial by your location
+1 346 248 7799 US (Houston)

+1 408 638 0968 US (San Jose)
+1 669 900 6833 US (San Jose)
+1 253 215 8782 US (Tacoma)
+1 312 626 6799 US (Chicago)
+1 646 876 9923 US (New York)
+1 301 715 8592 US (Washington DC) Meeting ID: 821 2316 0759 Find your local number: https://clackamascounty.zoom.us/u/kdbTXsqAPG

**The Apparent Low bid results will be posted to the projects OregonBuys listing as soon as possible following the bid opening.

3. **Good Faith Effort:** Clackamas County encourages participation in contracts by Historically Underrepresented Businesses. "Historically Underrepresented Businesses" are State of Oregon-certified and self-identified minority, women and emerging small business as well as firms that are certified federally or by another state or entity with substantially similar requirements as the State of Oregon.

   Bidders must perform Good Faith Effort (defined below) and submit **Form 1 and Form 2** for the Bidders Bid to be considered responsive. **Form 1 and Form 2** must be submitted within **two (2) hours** after the Closing Date and Time. Form 1 and Form 2 may be submitted by hand delivery to the location the Bid was due or may email the completed Forms to Procurement@clackamas.us. "Good Faith Effort" is a requirement of a prime contractor to reach out to at least three Historically Underrepresented Business Subcontractors for each division of work that will be subcontracted out and to complete the required forms. If fewer than three Historically Underrepresented Business Subcontractors are reasonably available for a particular division of work, the Bidder must specifically note the reason for there being fewer than three contacts. The outreach should be performed with sufficient time to give the subcontractors at least 5 calendar days to respond to the opportunity. Form 3, which documents the actual amount of subcontractors on the project, must be submitted with the project final pay application. Compliance with the Good Faith Effort and submission of Forms 1, 2 and 3 is a contractual requirement for final payment.

   The sufficiency of the documentation or the performance of Good Faith Effort shall be in the sole and absolute determination of Clackamas County. Only those Bidders that Clackamas County has determined have not sufficiently performed Good Faith Effort shall have protest rights of the determination for such Bidder. No Bidder shall have protest rights of the sufficiency of any other Bidder completing Good Faith Effort.

CLACKAMAS COUNTY
GOOD FAITH EFFORT
SUBCONTRACTOR AND SELF-PERFORMED WORK LIST
(FORM 1)

Prime Contractor Name: Apex Mechanical LLC. Total Contract Amount:

Project Name: BID# 2022-56 Public Safety Training Center MAU and Exhaust Replacement

PRIME SELF-PERFORMING: Identify below ALL GFE Divisions of Work (DOW) to be self-performed. Good Faith Efforts are otherwise required.

DOW BIDDER WILL SELF-PERFORM *(GFE not required)*	
Plumbing	
HVAC	
Electrical	

PRIME CONTRACTOR SHALL DISCLOSE AND LIST ALL SUBCONTRACTORS, including those Minority-owned, Woman-owned, and Emerging Small Businesses ("M/W/ESB") that you intend to use on the project. Hand delivery to Procurement, 2051 Kaen Road, Oregon City, OR 97045 or email to procurement@clackamas.us within 2 hours of the BID/Quote Closing Date/Time

LIST ALL SUBCONTRACTORS BELOW Use correct legal name of Subcontractor (No Assumed Business Names)	Division of Work (Painting, electrical, landscaping, etc.) List ALL DOW performed by Subcontractors	DOLLAR AMOUNT OF SUBCONTRACT	If Certified or self-reporting MBE/WBE/ESB Subcontractor Check box ☑		
			MBE	WBE	ESB
Name Delta Connects Address 17400 SW Upper Boones Ferry Rd Suite 230 City/St/Zip Durham, OR 97224 Phone# 1-503-670-7200 OCCB#	DDC	$47,071.00	☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐

GFE SUBCONTRACTOR AND SELF-PERFORMED WORK LIST (FORM 1) cont'd

Prime Contractor Name: Total Contract Amount:

Project Name: BID# 2022-56 Public Safety Training Center MAU ar
Exhaust Replacement

LIST ALL SUBCONTRACTORS BELOW Use correct legal name of Subcontractor (No Assumed Business Names)	Division of Work (Painting, electrical, landscaping, etc.) List ALL DOW performed by Subcontractors	DOLLAR AMOUNT OF SUBCONTRACT	If Certified or self-reporting MBE/WBE/ESB Subcontractor Check box ✔		
			MBE	WBE	ESB
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐
Name Address City/St/Zip Phone# OCCB#			☐	☐	☐

CLACKAMAS COUNTY
GOOD FAITH EFFORT
M/W/ESB CONTACT / BIDS RECEIVED LOG
(FORM 2)

Prime Contractor: Apex Mechanical LLC.

Project: BID# 2022-56 Public Safety Training Center MAU and Exhaust Replacement

Prime Contractor must contact or endeavor to contact at least 3 M/W/ESB Subcontractors for each Division of Work. Prime Contractor shall record its contacts with M/W/ESB Subcontractors through use of this log (or equivalent) entering all required information. All columns shall be completed where applicable. Additional forms may be copied if needed.

NAME OF M/W/ESB SUBCONTRACTOR	Divisions of Work (Painting, electrical, landscaping, etc.)	Date Solicitation Letter / Fax Sent	PHONE CONTACT		BID ACTIVITY Check Yes or No			REJECTED BIDS (if bid received & not used)		Notes
			Date of Call	Person Receiving Call	Will Bid	Bid Received	Bid Used	Bid Amount	Reason Not Used (Price, Scope or Other. If Other, explain in Notes>>)	
Service Proffessionals	Electrical		6/15/2022	Gabriel McCoy	☐ Yes ☒ No	☐ Yes ☐ No	☐ Yes ☐ No			
High Point Construction Services	Electrical		6/15/2022	Rene Christianson	☐ Yes ☒ No	☐ Yes ☐ No	☐ Yes ☐ No			
O'Neill Construction Group Inc	Electrical		6/15/2022	Maurice Rahming	☐ Yes ☒ No	☐ Yes ☐ No	☐ Yes ☐ No			
					☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			
					☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			
					☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			
					☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

BID BOND

Project Name: # 2022-56 Public Safety Training Center MAU and Exhaust Replacement

We, Apex Mechanical, LLC, as "Principal,"
(Name of Principal)

and Fidelity and Deposit Company of Maryland, an Illinois Corporation,
(Name of Surety)

authorized to transact Surety business in Oregon, as "Surety," hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns to pay unto Clackamas County ("Obligee") the sum of ($10% of Bid Amount)

Ten Percent (10%) of Bid Amount dollars.

WHEREAS, the condition of the obligation of this bond is that Principal has submitted its proposal or bid to an agency of the Obligee in response to Obligee's procurement document (No. 2022-56) for the project identified above which proposal or bid is made a part of this bond by reference, and Principal is required to furnish bid security in an amount equal to ten (10%) percent of the total amount of the bid pursuant to the procurement document.

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, we have caused this instrument to be executed and sealed by our duly authorized legal representatives this 23rd day of June, 2022.

Principal: Apex Mechanical, LLC

By: _____
Signature

Owner - Member
Official Capacity

Attest: Virginia Talbot
Corporation Secretary

Surety: Fidelity and Deposit Company of Maryland

By: Attorney-In-Fact , Amber Lynn Reese

_____
Name

800 Fifth Avenue, Suite 3800
Address

Seattle, WA 98104
City State Zip

(206) 622-1101
Phone

(206) 622-1405
Fax

Fidelity and Deposit Company of Maryland CORPORATE SEAL 1890

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by **Robert D. Murray, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **Linda Diane SHADDON, Dana Marie BRINKLEY, Tamara A. RINGEISEN, Kari Michelle MOTLEY, Misti Marie Brill, Donald Percell SHANKLIN, JR, Sara Sophie SELLIN, Michael S. MANSFIELD, Amber Lynn REESE of Portland, Oregon, EACH,** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings,** and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 04th day of February, A.D. 2021.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 04th day of February, A.D. 2021, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2023

Authenticity of this bond can be confirmed at bondvalidator.zurichna.com or 410-559-8790

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 23rd day of June, 2022.

By: Brian M. Hodges
Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
www.reportsfclaims@zurichna.com
800-626-4577

Authenticity of this bond can be confirmed at bondvalidator.zurichna.com or 410-559-8790

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

BID FORM

PROJECT: #2022-56 Public Safety Training Center MAU and Exhaust Replacement
BID CLOSING: June 23, 2022, 2:00 PM, Pacific Time
BID OPENING: June 23, 2022, 2:05 PM, Pacific Time

FROM: Apex Mechanical LLC.
Bidder's Name (must be full legal name, not ABN/DBA)

TO: Clackamas County
Procurement Division – procurement@clackamas.us

1. Bidder is (*check one of the following and insert information requested*):

____a. An individual; or

____b. A partnership registered under the laws of the State of _____; or

____c. A corporation organized under the laws of the State of _____; or

X d. A limited liability corporation organized under the laws of the State of Washington;

and authorized to do business in the State of Oregon hereby proposes to furnish all material and labor and perform all work hereinafter indicated for the above project in strict accordance with the Contract Documents for the Basic Bid as follows:

Six Hundred Fourty-Three Thousand, Nine Hundred Dollars ($ 643,900.00)

and the Undersigned agrees to be bound by the following documents:

- Notice of Public Improvement Contract Opportunity
- Instructions to Bidders
- Bid Bond
- Public Improvement Contract Form
- Clackamas County General Conditions
- Prevailing Wage Rates
- Plans, Specifications and Drawings
- Supplemental Instructions to Bidders
- Bid Form
- Performance Bond and Payment Bond
- Supplemental General Conditions
- Payroll and Certified Statement Form

- ADDENDA numbered 1 through 3, inclusive *(fill in blanks)*

2. The Undersigned proposes to add to or deduct from the Base Bid indicated above the items of work relating to the following Alternate(s) as designated in the Specifications: **N/A.**

3. The Undersigned proposes to add to or deduct from the Base Bid indicated above the items or work relating to the following Unit Price(s) as designated in the Specifications, for which any adjustments in the Contract amount will be made in accordance with Section D of the Clackamas County General Conditions: **Provide Attached Bid Schedule with Bid.**

4. The work shall be completed within the time stipulated and specified in Contract Documents.

5. Accompanying herewith is Bid Security which is equal to ten percent (10%) of the total amount of the Basic Bid, plus the total sum of all Alternatives (if any).

6. The Undersigned agrees, if awarded the Contract, to execute and deliver to Clackamas County, within twenty (20) calendar days after receiving the Contract forms, a Contract Form, and a satisfactory Performance Bond and Payment Bond each in an amount equal to one hundred percent (100%) of the Contract sum, using forms provided by the Owner. The surety requested to issue the Performance Bond and Payment Bond will be:

Fidelity and Deposit Company of Maryland
(name of surety company - not insurance agency)

The Undersigned hereby authorizes said surety company to disclose any information to the Owner concerning the Undersigned's ability to supply a Performance Bond and Payment Bond each in the amount of the Contract.

7. The Undersigned further agrees that the Bid Security accompanying the Bid is left in escrow with Clackamas County; that the amount thereof is the measure of liquidated damages which the Owner will sustain by the failure of the Undersigned to execute and deliver the above-named Contract Form, Performance Bond and Payment Bond, each as published, and that if the Undersigned defaults in either executing the Contract Form or providing the Performance Bond and Payment Bond within twenty (20) calendar days after receiving the Contract forms, then the Bid Security shall become the property of the Owner at the Owner's option; but if the Bid is not accepted within thirty (30) calendar days of the time set for the opening of the Bids, or if the Undersigned executes and timely delivers said Contract Form, Performance Bond and Payment Bond, the Bid Security shall be returned.

8. The Undersigned certifies that: (i) This Bid has been arrived at independently and is being submitted without collusion with and without any agreement, understanding, or planned common course of action with any other vendor of materials, supplies, equipment or services described in the invitation to bid designed to limit independent bidding or competition; and (ii) the contents of the Bid have not been communicated by the Undersigned or its employees or agents to any person not an employee or agent of the Undersigned or its surety on any Bond furnished with the Bid and will not be communicated to such person prior to the official opening of the Bid.

9. The undersigned ☒ **HAS,** ☐ **HAS NOT** (*check one*) paid unemployment or income taxes in Oregon within the past 12 months and ☐ **DOES,** ☒ **DOES NOT** (*check one*) a business address in Oregon. The undersigned acknowledges that, if the selected bidder, that the undersigned will have to pay all applicable taxes and register to do business in the State of Oregon before executing the Contract Form.

10. The Undersigned agrees, if awarded a contract, to comply with the provisions of ORS 279C.800 through 279C.870 pertaining to the payment of the prevailing rates of wage.

11. Contractor's CCB registration number is 217047. As a condition to submitting a bid, a Contractor must be registered with the Oregon Construction Contractors Board in accordance with ORS 701.035 to 701.055, and disclose the registration number. Failure to register and disclose the number will make the bid unresponsive and it will be rejected, unless contrary to federal law.

12. The successful Bidder hereby certifies that all subcontractors who will perform construction work as described in ORS 701.005(2) were registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time the subcontractor(s) made a bid to work under the contract.

13. The successful Bidder hereby certifies that, in compliance with the Worker's Compensation Law of the State of Oregon, its Worker's Compensation Insurance provider is Washington L&I, Policy No. 625,706-00, and that Contractor shall submit Certificates of Insurance as required.

14. Contractor's Key Individuals for this project (supply information as applicable):
Project Executive: Seth Wilson, Cell Phone: 360-558-1986,
Project Manager: Dalton Wagener, Cell Phone: 541-400-1391,
Job Superintendent: Carl Kangas, Cell Phone: 360-798-4258,
Project Engineer: Samantha Granger, Cell Phone: 360-666-8735.

15. The Undersigned certifies that it has not discriminated against minority, women, or emerging small businesses in obtaining any subcontracts for this project.

16. The Undersigned certifies that it has a drug testing program in accordance with ORS 279C.505.

REMINDER: Bidder must submit the below First-Tier Subcontractor Disclosure Form.

By signature below, Contractor agrees to be bound by this Bid.

NAME OF FIRM Apex Mechanical LLC.

ADDRESS 1507 SE Eaton Blvd.

Battle Ground, WA 98604

TELEPHONE NO 360-558-1986

EMAIL seth@apexmechanical.org

SIGNATURE 1) _____
Sole Individual

or 2) _____
Partner

or 3) _____
Authorized Officer or Employee of Corporation

* * * * * ***END OF BID*** * * * * *

Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Public Safety Training Center MAU and Exhaust Replacement **BID#2022-56**

No.	Item	Quantity	Unit of Measure	Unit Price or Lump Sum Price Figures	Total Amount Quantity x Unit Price
1	Mobilization (i.e. Crane etc)	1	Lump Sum	46,000.00	$ 46,000.00 -
2	Materials	1	Lump Sum	427,000.00	$ 427,000.00 -
3	Permits	1	Lump Sum	2,000.00	$ 2,000.00 -
4	Labor	1	Lump Sum	86,829	$ 86,829 -
5	DDC	1	Lump Sum	67,071.00	$ 67,071.00 -
6	Start-up and Testing	1	Lump Sum	15,000.00	15,000.00
				Total Bid for PSTC	**$ 643,900.00** -

Firm Name: Apex Mechanical LLC

Print Name: Seth Wilson

Authorized Signature:

Date: 6/23/22

FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM
PROJECT: #2022-56

BID OPENING: June 23, 2022, 2:00 PM, Pacific Time

Failure to submit this Form by the disclosure deadline will result in a nonresponsive bid.

INSTRUCTIONS:
This First-Tier Subcontractor Disclosure Form ("Form") must be submitted and received at the location specified in the Notice of Public Improvement Contract Opportunity on the advertised Bid Closing, and within two working hours after the advertised Bid Closing Time.

The Form may be mailed, hand-delivered or emailed to: Procurement@clackamas.us. It is the responsibility of Bidders to submit this Form and any additional sheets with the Project name clearly marked on the envelope or the subject line of the email.

Subcontractor lists may be submitted with the bid in the same envelope or email at the Bid Closing date and time. Subcontractor lists **MUST** be submitted within **two (2) hours** of the Bid Closing date and time.

List below the name of each subcontractor that will be furnishing labor, or labor and materials, for which disclosure is required, the category of work that the subcontractor will be performing, and the dollar value of the subcontract. Enter **"NONE"** if the value of the project bid is less than $100,000 or there are no subcontractors that need to be disclosed. ATTACH ADDITIONAL SHEETS IF NECESSARY.

	SUBCONTRACTOR NAME	DOLLAR VALUE	CATEGORY OF WORK
1.	Delta Connects	$47,071.00	DDC
2.			
3.			
4.			
5.			
6.			

The above listed first-tier subcontractor(s) are providing labor, or labor and material, with a Dollar Value equal to or greater than:

a) 5% of the total Contract Price, but at least $15,000. If the Dollar Value is less than $15,000 do not list the subcontractor above; or
b) $350,000 regardless of the percentage of the total Contract Price.

Firm Name: Apex Mechanical LLC.

Bidder Signature: _____ Phone # 360-852-1282

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT
SUPPLEMENTAL GENERAL CONDITIONS

PROJECT: 2022-56 Public Safety Training Center MAU and Exhaust Replacement

The following modifies the October 13, 2021 Clackamas County General Conditions for Public Improvement Contracts ("County General Conditions") for this Contract. Except as modified below, all other terms and conditions of the County General Conditions shall remain in effect.

1. Good Faith Effort

As a condition of Contractor being awarded a Contract for this Project, Contractor must complete Good Faith Effort outreach and documentation as described in the Supplemental Instructions to Bidders of the Solicitation Document.

The Contractor may not change who is performing each Division of Work identified in Form 1 of the Good Faith Effort without the express written advance approval of Owner. This includes substituting identified subcontractors, self-performance of a Division of Work that was identified to be performed by a subcontractor, or the Contractor subcontracting a Division of Work that was identified to be self-performed by the Contractor.

Contractor shall be required to submit the completed Form 3 with its final pay application as a condition of final payment.

CLACKAMAS COUNTY GENERAL CONDITIONS FOR PUBLIC IMPROVEMENT CONTRACTS
October 13, 2021

INSTRUCTIONS: The attached **Clackamas County General Conditions for Public Improvement Contracts ("County General Conditions")** apply to all designated Public Improvement contracts. Changes to the County General Conditions (including any additions, deletions or substitutions) should only be made by attaching Public Improvement Supplemental General Conditions. The text of these County General Conditions should not otherwise be altered.

TABLE OF SECTIONS

CLACKAMAS COUNTY GENERAL CONDITIONS FOR PUBLIC IMPROVEMENT CONTRACTS ("County General Conditions")

SECTION A
GENERAL PROVISIONS

A.1 DEFINITION OF TERMS

In the Contract Documents the following terms shall be as defined below:

APPLICABLE LAWS, means all federal, state and local laws, codes, rules, regulations and ordinances, as amended applicable to the Work, to the Contract, or to the parties individually.

APPROVED BY CONTRACTING AGENCY, for purposes of ORS 279C.570(2), means the date a progress payment is approved by the Clackamas County Treasurer's office.

ARCHITECT/ENGINEER, means the Person appointed by the Owner to make drawings and specifications and, to provide contract administration of the Work contemplated by the Contract to the extent provided herein or by supplemental instruction of Owner (under which Owner may delegate responsibilities to the Architect/Engineer), in accordance with ORS Chapter 671 (Architects) or ORS Chapter 672 (Engineers) and administrative rules adopted thereunder.

AVOIDABLE DELAYS, mean any delays other than Unavoidable Delays, and include delays that otherwise would be considered Unavoidable Delays but that: (a) Could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors; (b) Affect only a portion of the Work and do not necessarily prevent or delay the prosecution of other parts of the Work nor the completion of the whole Work within the Contract Time; (c) Do not impact activities on the accepted critical path schedule; and (d) Are associated with the reasonable interference of other contractors employed by the Owner that do not necessarily prevent the completion of the whole Work within the Contract Time.

BIDDER, means a bidder in connection with Instructions to Bidders or a proposer in connection with a Request for Proposals, or Solicitation Document. May also be referenced as "Offeror," "Quoter" or "Proposer" based on the type of Solicitation Document.

CHANGE ORDER, means a written order which, when fully executed by the Parties to the Contract, constitutes a change to the Contract Documents. Change Orders shall be issued in accordance with the changes provisions in Section D and, if applicable, establish a Contract Price or Contract Time adjustment. A Change Order shall not be effective until executed by both parties.

CLAIM, means a demand by Contractor pursuant to Section D.3 for review of the denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, submitted in accordance with the requirements and within the time limits established for review of Claims in these County General Conditions.

CONTRACT, means the written agreement between the Owner and the Contractor comprised of the Contract Documents which describe the Work to be done and the obligations between the parties.

CONTRACT DOCUMENTS, means the Contract, County General Conditions, Supplemental General Conditions if any, Plans, Specifications, the accepted Offer, Solicitation Document and addenda thereto, Instructions to Offerors, and Supplemental Instructions to Offerors.

CONTRACT PERIOD, as set forth in the Contract Documents, means the total period of time beginning with the full execution of a Contract and, if applicable, the issuance of a Notice to Proceed and concluding upon Final Completion.

CONTRACT PRICE, means the total price reflected in the Contract.

CONTRACT TIME, means any incremental period of time allowed under the Contract to complete any portion of the Work as reflected in the Project schedule.

CONTRACTOR, means the Person awarded the Contract for the Work contemplated.

DAYS, are calendar days, including weekdays, weekends and holidays, unless otherwise specified.

DEFECTIVE WORK, means Work that is not completed in accordance with the Specifications or the requirements of the Contract.

DIRECT COSTS, means, unless otherwise provided in the Contract Documents: the cost of materials, including sales tax and the cost of delivery; cost of labor which shall only include the applicable prevailing wage and fringe benefit (if applicable, and if paid to or on behalf of the employee) rate plus a maximum of a twelve percent (12%) markup on the prevailing wage (but not the fringe benefit) to cover Contractor's labor burden including but not limited to social security, Medicare, unemployment insurance, workers' compensation insurance, sick leave pay; substantiated Project cost increases for specific insurance (including, without limitation, Builder's Risk Insurance and Builder's Risk Installation Floater) or bond premiums; rental cost of equipment, and machinery required for execution of the Work; and the additional costs of field personnel directly attributable to the Work; travel expense reimbursement only if specifically authorized and only to the extent allowable under the County Contractor Travel Reimbursement Policy, hereby incorporated by reference.

FINAL COMPLETION, means the final completion of all requirements under the Contract, including Contract Closeout as described in Section K but excluding Warranty Work as described in Section I.2, and the final payment and release of all retainage, if any.

FORCE MAJEURE, means an act, event or occurrence caused by fire, riot, war, acts of God, terrorism, nature, sovereign, or public enemy, strikes, freight embargoes or any other act, event or occurrence that is beyond the control of the party to the Contract who is asserting Force Majeure.

NOTICE TO PROCEED, means the official written notice from the Owner stating that the Contractor is to proceed with the Work defined in the Contract Documents.

OFFER, means a bid in connection with Instructions to Bidders or a proposal in connection with a Request for Proposals, or Solicitation Document to do the work stated in the Solicitation Document at the price quoted. May also be referenced as "Bid," "Quote," or "Proposal" based on the type of Solicitation Document.

OVERHEAD, means those items which may be included in the Contractor's markup (general and administrative expense and profit) and that shall not be charged as Direct Cost of the Work, including without limitation such Overhead expenses as wages or salary of personnel above the level of foreman (i.e., superintendents and project managers), labor rates and fringe benefits above the applicable prevailing wage and fringe benefit (if applicable, and if paid to or on behalf of the employee), Contractor's labor burden for fringe benefit if paid to the employee, expenses of Contractor's offices and supplies at the Project Site (e.g. job trailer) and at Contractor's principal place of business and including expenses of personnel staffing the Project Site office and Contractor's principal place of business, and Commercial General Liability Insurance and Automobile Liability Insurance.

OWNER, means, Clackamas County or any component unit thereof including Clackamas County Development Agency, Clackamas County Service District No. 1, Surface Water Management Agency of Clackamas County, Tri-City Service District, Water Environment Services, North Clackamas Parks and Recreation District, Clackamas County Extension & 4-H Service District, Library Service District of Clackamas County, Enhanced Law Enforcement District, and Clackamas County Service District No. 5. Owner may elect, by written notice to Contractor, to delegate certain duties to more than one agent, including without limitation, to an Architect/Engineer. However, nothing in these County General Conditions is intended to abrogate the separate design professional responsibilities of Architects under ORS Chapter 671 or of Engineers under ORS Chapter 672.

PERSON, means a natural person or entity doing business as a sole proprietorship, a partnership, a joint venture, a corporation, a limited liability company or partnership, a nonprofit, a trust, or any other entity possessing the legal capacity to contract.

PLANS, means the drawings which show the location, type, dimensions, and details of the Work to be done under the Contract.

PRODUCT DATA, means illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

PROJECT, means the total undertaking to be accomplished for Owner by architects/engineers, contractors, and other others, including planning, study, design, construction, testing, commissioning, start-up, of which the Work to be performed under the Contract Documents is a part.

PROJECT SITE, means the specific real property on which the Work is to be performed, including designated contiguous staging areas, that is identified in the Plans, Specifications and Drawings.

PUNCH LIST, means the list of Work yet to be completed or deficiencies which need to be corrected in order to achieve Final Completion of the Contract.

RECORD DOCUMENT, means the as-built Plans, Specifications, testing and inspection records, product data, samples, manufacturer and distributor/supplier warranties evidencing transfer of ownership to Owner, operational and maintenance manuals, shop drawings, correspondence, certificate(s) of occupancy, and other documents listed in Subsection B.9.1 of these County General Conditions, recording all Services performed.

SAMPLES, means physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

SHOP DRAWINGS, means drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor (including any subsubcontractor), manufacturer, supplier, or distributor to illustrate some portion of the Work.

SOLICITATION DOCUMENT, means an Invitation to Bid, Request for Proposals, Request for Quotes, or other written document issued by Owner that outlines the required Specifications necessary to submit an Offer.

SPECIFICATION, means any description of the physical or functional characteristics of the Work, or of the nature of a supply, service or construction item included in the Solicitation Document. Specifications may include a description of any requirement for inspecting, testing or preparing a supply, service or construction item for delivery and the quantities or qualities of materials to be furnished under the Contract. Specifications generally will state the results or products to be obtained and may, on occasion, describe the method and manner of doing the Work to be performed. Specifications may be incorporated by reference and/or may be attached to the Contract.

SUBCONTRACTOR, means a Person having a direct contract with the Contractor, or another Subcontractor of any tier, to perform one or more items of the Work.

SUBSTANTIAL COMPLETION, means the date when the Owner accepts in writing the construction, alteration or repair constituting the Work or any designated portion thereof as having reached that state of completion when it may be used or occupied for its intended purpose. Substantial Completion of facilities with operating systems occurs only after thirty (30) continuous Days of successful, trouble-free operation of the operating systems as provided in Section K.3.2.

SUBSTITUTIONS, means items that in function, performance, reliability, quality, and general configuration are the same or better than the product(s) specified. Substitutions also means the performance of the Work by a labor force other than what is submitted in the Offer.

SUPPLEMENTAL GENERAL CONDITIONS, means those conditions that remove from, add to, or modify these County General Conditions. Public Improvement Supplemental General Conditions may be included in the Solicitation Document or may be a separate attachment to the Contract.

UNAVOIDABLE DELAYS, mean delays other than Avoidable Delays that are: (a) to the extent caused by any actions of the Owner, or any other employee or agent of the Owner, or by a separate contractor employed by the Owner; (b) to the extent caused by any Project Site conditions which differ materially from the conditions that would normally be expected to exist and inherent to the construction activities defined in the Contract Documents; or (c) to the extent caused by Force Majeure acts, or events or occurrences.

WORK, means the furnishing of all materials, equipment, labor, transportation, services, incidentals, those permits and regulatory approvals not provided by the owner necessary to successfully complete any individual item or the entire Contract and the carrying out of duties and obligations imposed by the Contract Documents for the Project.

A.2 SCOPE OF WORK

The Work contemplated under the Contract includes all labor, materials, transportation, equipment and services for, and incidental to, the completion of all work in connection with the Project described in the Contract Documents. The Contractor shall perform all Work necessary so that the Project can be legally occupied and fully used for the intended use as set forth in the Contract Documents.

A.3 INTERPRETATION OF CONTRACT DOCUMENTS

A.3.1 Unless otherwise specifically defined in the Contract Documents, words which have well-known technical meanings or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings. Contract Documents are intended to be complementary. Whatever is called for in one, is interpreted to be called for in all. However, in the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following descending order of precedence:

(a) The Contract and any amendments thereto, including Change Orders, with those of later date having precedence over those of an earlier date;
(b) The Supplemental General Conditions;
(c) County General Conditions;
(d) Plans and Specifications;
(e) The Solicitation Document, and any addenda thereto.

A.3.2 In the case of an inconsistency between Plans and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Owner's interpretation in writing as determined in Owners sole discretion.

A.3.3 If the Contractor finds discrepancies in, or omissions from the Contract Documents, or if the Contractor is in doubt as to their meaning, the Contractor shall at once notify the Owner. Matters concerning and interpretation of requirements of the Contract Documents will be decided by the Owner in the Owner's sole discretion, who may delegate that duty in some instances to the Architect/Engineer. Responses to Contractor's requests for interpretation of Contract Documents will be made in writing by Owner (or the Architect/Engineer) within any time limits agreed upon or otherwise with reasonable promptness. Contractor shall not proceed without direction in writing from the Owner (or Architect/Engineer).

A.3.4 References to standard specifications, manuals, codes of any technical society, organization or association, to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, laws or regulations in effect in the jurisdiction where the Project Site is located on the first published date of the Solicitation Document, except as may be otherwise specifically stated.

A.4 EXAMINATION OF PLANS, SPECIFICATIONS, AND PROJECT SITE

A.4.1 It is understood that the Contractor, before submitting an Offer, has made a careful examination of the Contract Documents; has become fully informed as to the quality and quantity of materials and the character of the Work required; and has made a careful examination of the location and conditions of the Work and the sources of supply for materials. The Owner will in no case be responsible for any loss or for any unanticipated costs that may be suffered by the Contractor as a result of the Contractor's failure to acquire full information in advance in regard to all conditions pertaining to the Work. No oral agreement or conversation with any officer, agent, or personnel of the Owner, or with the Architect/Engineer either before or after the execution of the Contract, shall affect or modify any of the terms or obligations herein contained. Contractor shall at all times be responsible for all utility locates regardless of the ownership of such utility infrastructure or service.

A.4.2 Should the Plans or Specifications fail to particularly describe the materials, kind of goods, or details of construction of any aspect of the Work, Contractor shall have the duty to make inquiry of the Owner and Architect/Engineer as to what is required prior to performance of the Work. Absent Specifications to the contrary, the materials or processes that would normally be used to produce first quality finished Work shall be considered a part of the Contract requirements.

A.4.3 Any design errors or omissions noted by the Contractor shall be reported promptly to the Owner, including without limitation, any nonconformity with Applicable Laws.

A.4.4 If the Contractor believes that adjustments to cost or Contract Time are involved because of clarifications or instructions issued by the Owner (or Architect/Engineer) in response to the Contractor's notices or requests for information, the Contractor must submit a written request to the Owner, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt by Contractor of the clarifications or instructions issued. If the Owner denies Contractor's request for additional compensation, additional Contract Time, or other relief that Contractor believes results from the clarifications or instructions, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process. If the Contractor fails to perform the obligations of Sections A.4.1 to A.4.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations.

A.4.5 If the Contractor believes that adjustments to cost or Contract Time are involved because of an Unavoidable Delay caused by differing Project Site conditions, the Contractor shall notify the Owner immediately of differing Project Site conditions before the area has been disturbed. The Owner will investigate the area and make a determination as to whether or not the conditions differ materially from either the conditions stated in the Contract Documents or those which could reasonably be expected in execution of this particular Contract. If Contractor and the Owner agrees that a differing Project Site condition exists, any adjustment to compensation or Contract Time will be determined based on the process set forth in Section D.2.2 for adjustments to or deletions from Work. If the Owner disagrees that a differing Project Site condition exists and denies Contractor's request for additional compensation or Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

A.5 INDEPENDENT CONTRACTOR STATUS

The service or services to be performed under the Contract are those of an independent contractor as defined in ORS 670.600. Contractor represents and warrants that it is not an officer, employee or agent of the Owner as those terms are used in ORS 30.265.

A.6 RETIREMENT SYSTEM STATUS AND TAXES

Contractor represents and warrants that it is not a contributing member of the Public Employees' Retirement System and will be responsible for any federal or state taxes applicable to payment received under the Contract. Contractor will not be eligible for any benefits from these Contract payments of federal Social Security, employment insurance, workers' compensation or the Public Employees' Retirement System, except as a self-employed individual. Unless the Contractor is subject to backup withholding, Owner will not withhold from such payments any amount(s) to cover Contractor's federal or state tax obligations.

A.7 GOVERNMENT EMPLOYMENT STATUS

A.7.1 If this payment is to be charged against federal funds, Contractor represents and warrants that it is not currently employed by the Federal Government. This does not preclude the Contractor from holding another contract with the Federal Government.

SECTION B
ADMINISTRATION OF THE CONTRACT

B.1 OWNER'S ADMINISTRATION OF THE CONTRACT

B.1.1 The Owner shall administer the Contract as described in the Contract Documents throughout the term of the Contract, including the one-year period for correction of Work. The Owner will act as provided in the Contract Documents, unless modified in writing in accordance with other provisions of the Contract. In performing these tasks, the Owner may rely on the Architect/Engineer or other agents to perform some or all of these tasks.

B.1.2 The Owner may visit the Project Site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. The Owner will not

make exhaustive or continuous on-Project Site inspections to check the quality or quantity of the Work. Unless otherwise required in a Change Order, the Owner will neither have control over or charge of, nor be responsible for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work.

B.1.3 Except as otherwise provided in the Contract Documents or when direct communications have been specifically authorized, the Owner and Contractor shall communicate with each other within a reasonable time frame about matters arising out of or relating to the Contract. Communications by and with the Architect/Engineer's consultants shall be through the Architect/Engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

B.1.4 Based upon the Architect/Engineer's evaluations of the Contractor's Application for Payment, or unless otherwise stipulated by the Owner, the Architect/Engineer will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

B.2 CONTRACTOR'S MEANS AND METHODS; MITIGATION OF IMPACTS

B.2.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the Project Site safety thereof and, except as stated below, shall be fully and solely responsible for the Project Site safety of such means, methods, techniques, sequences or procedures.

B.2.2 The Contractor is responsible to protect and maintain the Work during the course of construction and to mitigate any adverse impacts to the Project, including those caused by authorized changes, which may affect cost, schedule, or quality.

B.2.3 The Contractor is responsible for the actions of all its personnel, laborers, suppliers, agents, and Subcontractors on the Project. The Contractor shall enforce strict discipline and good order among Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of persons who are unfit or unskilled for the tasks assigned to them.

B.3 MATERIALS AND WORKMANSHIP

B.3.1 The intent of the Contract Documents is to provide for the construction and completion of every detail of the Work described. All Work shall be performed in a professional manner and, unless the means or methods of performing a task are specified elsewhere in the Contract Documents, Contractor shall employ methods that are generally accepted and used by the industry, in accordance with industry standards.

B.3.2 The Contractor is responsible to perform the Work as required by the Contract Documents. Defective Work shall be corrected at the Contractor's sole expense and within a reasonable time frame.

B.3.3 Work done and materials furnished may be subject to inspection and/or observation and testing by the Owner to determine if they conform to the Contract Documents. Inspection of the Work by the Owner does not relieve the Contractor of responsibility for the Work in accordance with the Contract Documents.

B.3.4 Contractor shall furnish adequate facilities, as required, for the Owner to have safe access to the Work including without limitation walkways, railings, ladders, tunnels, and platforms. Producers, suppliers, and fabricators shall also provide proper facilities and access to their facilities.

B.3.5 The Contractor shall furnish Samples of materials for testing by the Owner and include the cost of the Samples in the Contract Price.

B.4 PERMITS

Contractor shall obtain and pay for all necessary permits, licenses and fees, except for those specifically excluded in the Supplemental General Conditions, as required for the project. Contractor shall be responsible for all violations of the law. Contractor shall give all requisite notices to public authorities.

B.5 COMPLIANCE WITH GOVERNMENT REGULATIONS

B.5.1 Contractor shall comply with Applicable Laws, as amended pertaining to the Work and the Contract. Failure to comply with such requirements shall constitute a breach of Contract and shall be grounds for Contract termination. Without limiting the generality of the foregoing, Contractor expressly agrees to comply with the following, as applicable and as may be amended from time to time: (i) Title VI and VII of Civil Rights Act of 1964, as amended; (ii) Section 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Health Insurance Portability and Accountability Act of 1996; (iv) the Americans with Disabilities Act of 1990, as amended; (v) ORS Chapter 659A; as amended; (vi) all regulations and administrative rules established pursuant to any applicable laws; and (vii) all other applicable requirements of federal, state, county or other local government entity statutes, rules and regulations.

B.5.2 Contractor shall comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations, and

(a) Contractor shall not discriminate against Disadvantaged, Minority, Women or Emerging Small Business enterprises, as those terms are defined in ORS 200.005, or a business enterprise that is owned or controlled by or that employs a disabled veteran, as that term is defined in ORS 408.225, in the awarding of subcontracts.

(b) Contractor shall maintain, in current and valid form, all licenses and certificates required by Applicable Laws or the Contract when performing the Work.

B.5.3 Contractor shall certify that it shall not accept a bid from Subcontractors to perform Work unless such Subcontractors are registered with the Construction Contractors Board in accordance with ORS 701.021 at the time they submit their bids to the Contractor.

B.5.4 Contractor shall certify that each landscape contracting business, as defined in ORS 671.520(2), performing Work under the Contract holds a valid landscape construction professional license issued pursuant to ORS 671.560.

B.5.5 The following notice is applicable to Contractors who perform excavation Work. ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the center at (877) 668-4001.

B.5.6 Failure to comply with any or all of the requirements of B.5.1 through B.5.5 shall be a material breach of Contract and constitute

grounds for Contract termination. Damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

B.5.7 The Contractor shall include in each subcontract those provisions required under ORS 279C.580.

B.5.8 Contractor shall comply with ORS 652.220, compliance of which is a material element of this Contract and failure to comply is a material breach that entitles County to exercise any rights and remedies available under this Contract including, but not limited to, termination for default.

B.6 SUPERINTENDENCE

Contractor shall keep on the Project Site, during the progress of the Work, a competent superintendent and any necessary assistants who shall be satisfactory to the Owner and who shall represent the Contractor on the Project Site. Directions given to the superintendent by the Owner shall be confirmed in writing to the Contractor.

B.7 INSPECTION

B.7.1 Owner shall have access to the Work at all times.

B.7.2 Inspection of the Work will be made by the Owner at its discretion. The Owner will have authority to reject Work that does not conform to the Contract Documents in the Owner's sole discretion. Any Work found to be not in conformance with the Contract Documents, in the discretion of the Owner, shall be removed and replaced at the Contractor's expense.

B.7.3 Contractor shall make or obtain at the appropriate time all tests, inspections and approvals of portions of the Work required by the Contract Documents or by Applicable Laws or orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work. The Contractor shall give the Owner timely notice of when and where tests and inspections are to be made so that the Owner may be present for such procedures. Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Owner.

B.7.4 As required by the Contract Documents, Work done or material used without required inspection or testing and/or without providing timely notice to the Owner may be ordered removed at the Contractor's expense.

B.7.5 If directed to do so by Owner or other permitting authority any time before the Work is accepted, the Contractor shall uncover portions of the completed Work for inspection. After inspection, the Contractor shall restore such portions of Work to the standard required by the Contract. If the Work uncovered is unacceptable or was done without required testing or inspection or sufficient notice to the Owner, the uncovering and restoration shall be done at the Contractor's expense. If the Work uncovered is acceptable and was done with sufficient notice to the Owner, the uncovering and restoration will be paid for pursuant to a Change Order.

B.7.6 If any testing or inspection reveals failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Owner's and Architect/Engineer's services and expenses, shall be at the Contractor's expense.

B.7.7 In Owner's sole discretion, it may authorize other interested parties to inspect the Work affecting their interests or property. Their right to inspect shall not make them a party to the Contract and shall not interfere with the rights of the parties of the Contract. Instructions or orders of such parties shall be transmitted to the Contractor, through the Owner.

B.8 SUBCONTRACTS AND ASSIGNMENT

B.8.1 Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound by the terms and conditions of these General Conditions and Supplemental General Conditions, and to assume toward the Contractor all of the obligations and responsibilities which the Contractor assumes toward the Owner thereunder, unless (1) the same are clearly inapplicable to the subcontract at issue because of legal requirements or industry practices, or (2) specific exceptions are requested by Contractor and approved in writing by Owner. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with sub-subcontractors at any level.

B.8.2 At Owner's request, Contractor shall submit to Owner prior to their execution either Contractor's form of subcontract, or the subcontract to be executed with any particular Subcontractor. If Owner disapproves such form, Contractor shall not execute the form until the matters disapproved are resolved to Owner's satisfaction. Owner's review, comment upon or approval of any such form shall not relieve Contractor of its obligations under this Agreement or be deemed a waiver of such obligations of Contractor.

B.8.3 Contractor shall not assign, sell, or transfer its rights, or delegate its responsibilities under the Contract, in whole or in part, without the prior written approval of the Owner. No such written approval shall relieve Contractor of any obligations of the Contract, and any transferee shall be considered the agent of the Contractor and bound to perform in accordance with the Contract Documents. Contractor shall remain liable as between the original parties to the Contract as if no assignment had occurred.

B.9 OWNER'S RIGHT TO DO WORK

Owner reserves the right to perform other or additional work at or near the Project Site with other agents than those of the Contractor. If such work takes place within or next to the Project Site, Contractor shall coordinate work with the other contractors or agents, cooperate with all other contractors or forces, carry out the Work in a way that will minimize interference and delay for all agents involved, place and dispose of materials being used so as not to interfere with the operations of another, and join the Work with the work of the others in an acceptable manner and perform it in proper sequence to that of the others. The Owner will resolve any disagreements that may arise between or among Contractor and the other contractors over the method or order of doing all work (including the Work). In case of unavoidable interference, the Owner will establish work priority (including the Work) in the Owner's sole discretion.

B.10 OTHER CONTRACTS

In all cases and at any time, the Owner has the right to execute other contracts related to or unrelated to the Work of the Contract. The Contractor of the Contract shall fully cooperate with any and all other contractors without additional cost to the Owner in the manner described in Section B.13.

B.11 ALLOWANCES

B.11.1 The Contractor shall include in the Contract Price all allowances stated in the Contract Documents. Items covered by allowances

shall be supplied for such amounts and by such persons or entities as the Owner may direct.

B.11.2 Unless otherwise provided in the Contract Documents:

(a) when finally reconciled, allowances shall cover the cost of the Contractor's materials and equipment delivered at the Project Site and all required taxes, less applicable trade discounts;

(b) Contractor's costs for unloading and handling at the Project Site, labor, installation costs, Overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Price but not in the allowances;

(c) whenever costs are more than or less than allowances, the Contract Price shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (i) the difference between actual costs and the allowances under Section B.17.2(a) and (ii) changes in Contractor's costs under Section B.17.2(b);

(d) Unless Owner requests otherwise, Contractor shall provide to Owner a proposed fixed price for any allowance work prior to its performance.

B.12 SUBMITTALS, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

B.12.1 The Contractor shall prepare and keep current, for the Architect's/Engineer's approval (or for the approval of Owner if approval authority has not been delegated to the Architect/Engineer), a schedule and list of submittals which is coordinated with the Contractor's construction schedule and allows the Architect/Engineer reasonable time to review submittals. Owner reserves the right to finally approve the schedule and list of submittals. Submittals include, without limitation, Shop Drawings, Product Data, and Samples.

B.12.2 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review of submittals by the Architect/Engineer is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, or for approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any construction means, methods, techniques, sequences or procedures, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's submittals shall not relieve the Contractor of its obligations under the Contract Documents. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Informational submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.

B.12.3 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect/Engineer Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect/Engineer without action.

B.12.4 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

B.12.5 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect/Engineer.

B.12.6 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect/Engineer's review or approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and (i) the Architect/Engineer has given written approval to the specific deviation as a minor change in the Work, or (ii) a Change Order has been executed by Owner authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect/Engineer's review or approval thereof.

B.12.7 In the event that Owner elects not to have the obligations and duties described under this Section B.18 performed by the Architect/Engineer, or in the event no Architect/Engineer is employed by Owner on the Project, all obligations and duties assigned to the Architect/Engineer hereunder shall be performed by the Owner.

B.13 SUBSTITUTIONS

The Contractor may make Substitutions only with the written consent of the Owner, after evaluation by the Owner and only in accordance with a Change Order. Substitutions shall be subject to the requirements of the Solicitation Document. By making requests for Substitutions, the Contractor represents that the Contractor has personally investigated the proposed substitute product; represents that the Contractor will provide the same warranty for the Substitution that the Contractor would for the product originally specified unless approved otherwise; certifies that the cost data presented is complete and includes all related costs under the Contract including redesign costs, and waives all claims for additional costs related to the Substitution which subsequently become apparent; and will coordinate the installation of the accepted Substitution, making such changes as may be required for the Work to be completed in all respects.

B.14 USE OF PLANS AND SPECIFICATIONS

Plans, Specifications and related Contract Documents furnished to Contractor by Owner or Owner's Architect/Engineer shall be used solely for the performance of the Work under the Contract. Contractor and its Subcontractors and suppliers are authorized to use and reproduce applicable portions of such documents appropriate to the execution of the Work, but shall not claim any ownership or other interest in them beyond the scope of the Contract, and no such interest shall attach. Unless otherwise indicated, all common law, statutory and other reserved rights, in addition to copyrights, are retained by Owner.

SECTION C
WAGES AND LABOR

C.1 PREVAILING WAGE RATES ON PUBLIC WORKS

Contractor shall comply fully with the provisions of ORS 279C.800 through 279C.870. Pursuant to ORS 279C.830(1)(d), Contractor shall pay workers at not less than the specified minimum hourly rate of wage, and shall include that requirement in all subcontracts. If the Work is subject to both the state prevailing wage rate law and the federal Davis-Bacon Act, Contractor shall pay the higher of the applicable state or federal prevailing rate of wage. Contractor shall provide written notice to all workers of the number of hours per day and days per week such workers may be required to work.

C.2 PAYROLL CERTIFICATION AND FEE REQUIREMENTS

C.2.1 In accordance with ORS 279C.845, the Contractor and every Subcontractor shall submit written certified statements to the Owner on the form prescribed by the Commissioner of the Bureau of Labor and Industries ("BOLI"), certifying the hourly rate of wage paid each worker which the Contractor or the Subcontractor has employed on the Project and further certifying that no worker employed on the Project has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract, which certificate and statement shall be verified by the oath of the Contractor or the Subcontractor that the Contractor or Subcontractor has read the certified statement, that the Contractor or Subcontractor knows the contents of the certified statement, and, that to the Contractor's or Subcontractor's best knowledge and belief, the certified statement is true. The certified statements shall set out accurately and completely the payroll records for the prior week, including the name and address of each worker, the worker's correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid. Certified statements for each week during which the Contractor or Subcontractor has employed a worker on the Project shall be submitted once a month, by the fifth (5^{th}) business day of the following month. The Contractor and Subcontractors shall preserve the certified statements for a period of ten (10) years from the date of completion of the Contract.

C.2.2 Pursuant to ORS 279C.845(7), the Owner shall retain 25 percent of any amount earned by the Contractor on the Project until the Contractor has filed the certified statements required by section C.2.1. The Owner shall pay to the Contractor the amount retained under this subsection within 14 days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements.

C.2.3 Pursuant to ORS 279C.845(8), the Contractor shall retain 25 percent of any amount earned by a first-tier Subcontractor on this Project until the first-tier Subcontractor has filed with the Owner the certified statements required by C.2.1. Before paying any amount retained under this subsection, the Contractor shall verify that the first-tier Subcontractor has filed the certified statement. Within 14 days after the first-tier Subcontractor files the required certified statement the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection.

C.2.4 In accordance with statutory requirements and administrative rules promulgated by the Commissioner of the Bureau of Labor and Industries, the fee required by ORS 279C.825(1) will be paid by Owner to the Commissioner.

C.3 PROMPT PAYMENT AND CONTRACT CONDITIONS

C.3.1 As a condition to Owner's performance hereunder, the Contractor shall:

C.3.1.1 Make payment promptly, as due, to all persons supplying to Contractor labor or materials for the prosecution of the Work provided for in the Contract.

C.3.1.2 Pay all contributions or amounts due the State Industrial Accident Fund or successor program from such Contractor or Subcontractor incurred in the performance of the Contract.

C.3.1.3 Not permit any lien or claim to be filed or prosecuted against the Owner on account of any labor or material furnished. Contractor will not assign any claims that Contractor has against Owner, or assign any sums due by Owner, to Subcontractors, suppliers, or manufacturers, and will not make any agreement or act in any way to give Subcontractors a claim or standing to make a claim against the Owner.

C.3.1.4 Pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.

C.3.2 If Contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to the Contractor of a Subcontractor by any person in connection with the Project as such claim becomes due, the proper officer(s) representing the Owner may pay the claim and charge the amount of the payment against funds due or to become due Contractor under the Contract. Payment of claims in this manner shall not relieve the Contractor or the Contractor's surety from obligation with respect to any unpaid claims.

C.3.3 Contractor shall include in each subcontract for property or services entered into by the Contractor and a first-tier subcontractor, including a material supplier, for the purpose of performing a construction contract, a payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under its subcontract within ten (10) Days out of such amounts as are paid to the Contractor by the Owner under such contract.

C.3.4 If the Contractor or a first-tier subcontractor fails, neglects or refuses to pay a person that provides labor or materials in connection with the Contract within 30 days after receiving payment from the contracting agency or a contractor, the Contractor or first-tier subcontractor owes the person the amount due plus interest charges that begin at the end of the 10-day period within which payment is due under ORS 279C.580 (4) and that end upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest on the amount due is nine percent per annum. The amount of interest may not be waived.

C.3.5 If the Contractor or a subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the Contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580.

C.3.6 All employers, including Contractor, that employ subject workers who work under the Contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its Subcontractors complies with these requirements.

C.3.7 In accordance with ORS 279C.570, for all subcontracts that exceed $500,000 that the Contractor withholds retainage, the Contractor shall place amounts deducted as retainage into an interest-bearing escrow account. Interest on the retainage amount accrues from the

date the payment request is approved until the date the retainage is paid to the Subcontractor to which it is due.

C.4 PAYMENT FOR MEDICAL CARE

As a condition to Owner's performance hereunder, Contractor shall promptly, as due, make payment to any person, co-partnership, association or corporation furnishing medical, surgical, and hospital care or other needed care and attention, incident to sickness or injury, to the employees of the Contractor, of all sums of which the Contractor agrees to pay for the services and all moneys and sums that the Contractor collected or deducted from the wages of employees under any law, contract or agreement for the purpose of providing or paying for the services.

C.5 HOURS OF LABOR

As a condition to Owner's performance hereunder, no person shall be employed to perform Work under the Contract for more than ten (10) hours in any one day or forty (40) hours in any one week, except in cases of necessity, emergency or where public policy absolutely requires it. In such instances, Contractor shall pay the employee at least time and a half pay:

(a) For all overtime in excess of eight (8) hours a day or forty (40) hours in any one week when the work week is five consecutive Days, Monday through Friday; or

(b) For all overtime in excess of ten (10) hours a day or forty (40) hours in any one week when the work week is four consecutive Days, Monday through Friday; and

(c) For all Work performed on Saturday and on any legal holiday specified in ORS 279C.540.

This Section C.5 will not apply to Contractor's Work under the Contract to the extent Contractor is currently a party to a collective bargaining agreement with any labor organization.

This Section C.5 shall not excuse Contractor from completion of the Work within the time required under the Contract.

SECTION D
CHANGES IN THE WORK

D.1 CHANGES IN WORK

D.1.1 The terms of the Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever, without prior written agreement and then only after any necessary approvals have been obtained. A Change Order is required to modify the Contract, which shall not be effective until its execution by the parties to the Contract and all approvals required by public contracting laws have been obtained.

D.1.2 It is mutually agreed that changes in Plans, quantities, or details of construction may be necessary or desirable during the course of construction. Within the general scope of the Contract, the Owner may at any time, without notice to the sureties and without impairing the Contract, require changes it deems necessary or desirable within the scope of this Project and consistent with this Section D.1. All changes to the Work shall be documented and Change Orders shall be executed under the conditions of the Contract Documents. Such changes may include, but are not limited to:

(a) Modification of specifications and design.
(b) Increases or decreases in quantities.
(c) Increases or decreases to the amount of Work.
(d) Addition or elimination of any Work item.
(e) Change in the duration of the Project.
(f) Acceleration or delay in performance of Work.
(g) Deductive changes.

Deductive changes are those that reduce the scope of the Work, and shall be made by mutual agreement whenever feasible. In cases of suspension or partial termination under Section J, Owner reserves the right to unilaterally impose a deductive change and to self-perform such Work, for which the provisions of Section B.13 (Owner's Right to Do Work) shall then apply. Adjustments in compensation shall be made under Section D.1.3, in which costs for deductive changes shall be based upon a Direct Costs adjustment together with the related percentage markup specified for profit, Overhead and other indirect costs, unless otherwise agreed to by Owner.

D.1.3 The Owner and Contractor agree that adjustments to or deletions from the Work shall be administered and compensated according to the following:

(a) Unit Pricing: Unit pricing may be utilized at the Owner's option when unit prices or solicitation alternates were provided that established the cost for adjustments to Work, and a binding obligation exists under the Contract on the parties covering the terms and conditions of the adjustment to Work.

(b) Fixed Fee: If the Owner elects not to utilize unit pricing, or in the event that unit pricing is not available or appropriate, fixed pricing may be used for adjustments to or deletions from the Work. In fixed pricing, the basis of payments or total price shall be agreed upon in writing between the parties to the Contract, and shall be established before the Work is done whenever feasible. Notwithstanding the foregoing, the mark-ups set forth in Section D.1.3(c) shall be utilized in establishing fixed pricing, and such mark-ups shall not be exceeded. Cost and price data relating to adjustments to or deletions from the Work shall be supplied by Contractor to Owner upon request, but Owner shall be under no obligation to make such requests.

(c) Time and Material: In the event that unit pricing and fixed pricing are not utilized, then adjustments to or deletions from the Work shall be performed on a cost reimbursement basis for Direct Costs. Such Work shall be compensated on the basis of the actual, reasonable and allowable cost of labor, equipment, and material furnished on the Work performed. The Contractor or Subcontractor who performs the Work shall be allowed to add up to ten percent (10%) markup to the Direct Costs as full compensation for profit, Overhead and other indirect costs for Work performed with the Contractor's or Subcontractor's own agents

Each ascending tier Subcontractor or the Contractor that did not perform the Work, will be allowed to add up to five percent (5%) supplemental markup on the Direct Costs of the Work (but not the above allowable markups) covered by a Change Order. No additional markup shall be permitted for any third tier or greater descending Subcontractor.

Example: $20,000 of Direct Costs Work performed by a 2nd Tier Subcontractor

	Markup	Allowed Total Fee Plus Markup
General Contractor	5%	$1,000.00
1st Tier Sub Contractor	5%	$1,000.00
2nd Tier Sub Contractor	10%	$22,000.00

(d) Payments made to the Contractor shall be complete compensation for Overhead, profit, and all costs that were incurred by the Contractor or by other agents furnished by the Contractor, including Subcontractors, for adjustments to or deletions from the Work pursuant to a Change Order. Owner may establish a maximum cost for additional Work under this Section D.1.3, which shall not be exceeded for reimbursement without additional written

authorization from Owner in the form of a Change Order. Contractor shall not be required to complete such additional Work without additional authorization.

D.1.4 Any necessary adjustment of Contract Time that may be required as a result of adjustments to or deletions from the Work must be agreed upon by the parties before the start of the revised Work unless Owner authorizes Contractor to start the revised Work before agreement on Contract Time adjustment.

Contractor shall submit any request for additional compensation (and additional Contract Time if Contractor was authorized to start Work before an adjustment of Contract Time was approved) as soon as possible but no later than thirty (30) Days after receipt of Owner's request for additional Work . If Contractor's request for additional compensation or adjustment of Contract Time is not made within the thirty (30) Day time limit, Contractor's requests pertaining to that additional Work shall be barred. The thirty (30) Day time limit for making requests shall not be extended for any reason, including without limitation Contractor's claimed inability to determine the amount of additional compensation or adjustment of Contract Time, unless an extension is granted in writing by Owner. If the Owner denies Contractor's request for additional compensation or adjustment of Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process. No other reimbursement, compensation, or payment will be made, except as provided in Section D.1.5 for impact claims.

D.1.5 If any adjustment to Work under Section D.1.3 causes an increase or decrease in the Contractor's cost of, or the Contract Time required for the performance of any other part of the Work under the Contract, Contractor shall submit a written request to the Owner, setting forth the nature and specific extent of the request, including all time and cost impacts against the Contract as soon as possible, but no later than thirty (30) Days after receipt of Owner's request for adjustments to or deletions from the Work by Contractor.

The thirty (30) Day time limit applies to claims of Subcontractors, suppliers, or manufacturers who may be affected by Owner's request for adjustments to or deletions from the Work and who request additional compensation or an extension of Contract Time to perform; Contractor has responsibility for contacting its Subcontractors, suppliers, or manufacturers within the thirty (30) Day time limit, and including their requests with Contractor's requests. If the request involves Work to be completed by Subcontractors, or materials to be furnished by suppliers or manufacturers, such requests shall be submitted to the Contractor in writing with full analysis and justification for the adjustments to compensation and Contract Time requested. The Contractor shall analyze and evaluate the merits of the requests submitted by Subcontractors, suppliers, and manufacturers to Contractor prior to including those requests and Contractor's analysis and evaluation of those requests with Contractor's requests for adjustments to compensation or Contract Time that Contractor submits to the Owner. Failure of Subcontractors, suppliers, manufacturers or others to submit their requests to Contractor for inclusion with Contractor's requests submitted to Owner within the time period and by the means described in this section shall constitute a waiver of these Subcontractor claims. The Owner will not consider direct requests or claims from Subcontractors, suppliers, manufacturers or others not a party to the Contract. The consideration of such requests and claims under this section does not give any Person, not a party to the Contract the right to bring a claim against Owner, whether in this claims process, in litigation, or in any dispute resolution process.

If the Owner denies the Contractor's request for adjustment to compensation or Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

D.1.6 No request or Claim by the Contractor for additional costs or an adjustment of Contract Time shall be allowed if made after receipt of final payment application under the Contract. Final payment application must be made by Contractor within the time required under Section E.6.4.

D.1.7 It is understood that changes in the Work are inherent in construction of this type. The number of changes, the scope of those changes, and the effect they have on the progress of the original Work cannot be defined at this time. The Contractor agrees that it will work in good faith with Owner to undertake changes, when agreed upon by execution of a Change Order. Each change will be evaluated for extension of Contract Time and increase or decrease in compensation based on its own merit.

D.2 DELAYS

D.2.1 Contractor shall not be entitled to additional compensation or additional Contract Time for Avoidable Delays.

D.2.2 In the event of Unavoidable Delays, Contractor may be entitled to the following:

(a) Contractor may be entitled to additional compensation or additional Contract Time, or both, for Unavoidable Delays described in Section D.2.1.2 (a) and (b).

(b) Contractor may be entitled to additional Contract Time for Unavoidable Delays described in Section D.2.1.2(c) and (d).

In the event of any requests for additional compensation or additional Contract Time, or both, as applicable, arising under this Section D.2.2 for Unavoidable Delays, other than requests for additional compensation or additional Contract Time for differing Project Site conditions for which a review process is established under Section A.4.5, Contractor shall submit a written notification of the delay to the Owner within two (2) Days of the occurrence of the cause of the delay. This written notification shall state the cause of the potential delay, the Project components impacted by the delay, and the anticipated additional Contract Time extension or the additional compensation, or both, as applicable, resulting from the delay. Within seven (7) Days after the cause of the delay has been mitigated, or in no case more than thirty (30) Days after the initial written notification, the Contractor shall submit to the Owner, a complete and detailed request for additional compensation or additional Contract Time, or both, as applicable, resulting from the delay. If the Owner denies Contractor's request for additional compensation or adjustment of Contract Time, the Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

If Contractor does not timely submit the notices required under this Section D.2, Contractor's Claim shall be barred.

D.3 CLAIMS REVIEW PROCESS

D.3.1 All Contractor Claims shall be referred to the Owner for review. Contractor's Claims, including Claims for adjustments to compensation or Contract Time, shall be submitted in writing by Contractor to the Owner within five (5) Days after a denial of Contractor's initial request for an adjustment of Contract terms, payment of money, extension of Contract Time or other relief, provided that such initial request has been submitted in accordance with the requirements and within the time limits established in these County General Conditions. Within thirty (30) Days after the initial Claim, Owner shall receive from Contractor a complete and detailed description of the Claim (the "Detailed Notice") that includes all information required by Section D.3.2. Unless the Claim is made in accordance with these time requirements, it shall be barred.

D.3.2 The Detailed Notice of the Claim shall be submitted in writing by Contractor and shall include all information, records and documentation necessary for the Owner to properly and completely evaluate the claim, including, but not limited to a detailed, factual statement of the basis of the Claim, pertinent dates, Contract provisions which support or allow the Claim, reference to or copies of any documents which support the Claim, the dollar value of the Claim, and the Contract Time adjustment requested for the Claim. If the Claim involves Work to be completed by Subcontractors, the Contractor will analyze and evaluate the merits of the Subcontractor claim prior to forwarding it and that analysis and evaluation to the Owner. The Owner will not consider direct claims from Subcontractors, suppliers, manufacturers, or others not a party to the Contract. Contractor agrees that it will make no agreement, covenant, or assignment, nor will it commit any other act that will permit or assist any Subcontractor, supplier, manufacturer, or other to directly or indirectly make a claim against Owner.

D.3.3 The Owner, through the Architect/Engineer (or other employee or agent assigned by the Owner) will review all Claims and take one or more of the following preliminary actions within ten (10) Days of receipt of the Detailed Notice of a Claim: (1) request additional supporting information from the Contractor; (2) inform the Contractor and Owner in writing of the time required for adequate review and response; (3) reject the Claim in whole or in part and identify the reasons for rejection; (4) recommend approval of all or part of the Claim; (5) arrange a meeting with the Contractor for formal review of the Claim; or (6) propose an alternate resolution.

D.3.4 Once the Engineer or Project Manager determines the Owner is in receipt of a properly submitted claim, the Engineer or Project Manager may arrange a meeting, as agreed by the parties, with the Contractor in order to present the claim for formal review and discussion. A person authorized by the Contractor to execute Change Orders on behalf of the Contractor must be present and attend all claim meetings.

D.3.5 The Owner's decision, through the Architect/Engineer (or other employee or agent assigned by the Owner), shall be final and binding on the Contractor unless appealed by written notice to the Owner within fifteen (15) Days of receipt of the decision. The Contractor must present written documentation supporting the Claim within fifteen (15) Days of the notice of appeal. After receiving the appeal documentation, the Owner, through the appropriate department director, shall review the materials and render a decision within thirty (30) Days after receiving the appeal documents.

D.3.6 If, at any step in the claim decision or review process, the Contractor fails to promptly submit requested information or documentation that the Owner deems necessary to analyze the claim, the Contractor is deemed to have waived its right to further review, and the Claim will not be considered properly filed and preserved.

D.3.7 Both parties agree to exercise their best efforts in good faith to resolve all disputes within sixty (60) Days of the issuance of the appeal in Section D. 3.4 above. If the parties are unable to resolve their issues through mediation or otherwise, either party may seek redress through all available remedies in equity or in law.

D.3.8 Unless otherwise directed by Owner, Contractor shall proceed with the Work while any Claim, or mediation or litigation arising from a Claim, is pending. Regardless of the review period or the final decision of the Owner, the Contractor shall continue to diligently pursue the Work as identified in the Contract Documents. In no case is the Contractor justified or allowed to cease or delay Work, in whole or in part, without a written stop work order from the Owner.

SECTION E
PAYMENTS

E.1 SCHEDULE OF VALUES

The Contractor shall submit, by or before the pre-construction conference (as described in Section H.1.3), a schedule of values ("Schedule of Values") for the Contract Work. This schedule shall provide a breakdown of values for the Contract Work and will be the basis for progress payments. The breakdown shall demonstrate reasonable, identifiable, and measurable components of the Work. Unless objected to by the Owner, this schedule shall be used as the basis for reviewing Contractor's applications for payment. If objected to by Owner, Contractor shall revise the schedule of values and resubmit the same for approval of Owner.

E.2 APPLICATIONS FOR PAYMENT

E.2.1 Owner shall make progress payments on the Contract monthly as Work progresses, in accordance with the requirements of this Section E.2 and ORS 279C.570. Applications for payment shall be based upon estimates of Work completed and the Schedule of Values. As a condition precedent to Owner's obligation to pay, all applications for payment shall be approved by the Owner. A progress payment shall not be considered acceptance or approval of any Work or waiver of any defects therein. Owner shall pay to Contractor interest in accordance with ORS 279C.570 for overdue invoices, not including retainage, due the Contractor. Overdue invoices will be those that have not been paid within the earlier of:

(a) Thirty (30) days after receipt of the invoice; or

(b) Fifteen (15) days after the payment is approved by the County.

Notwithstanding the foregoing, in instances when an application for payment is filled out incorrectly, or when there is any defect or impropriety in any submitted application or when there is a good faith dispute, Owner shall so notify the Contractor within fifteen (15) Days stating the reason or reasons the application for payment is defective or improper or the reasons for the dispute. A defective or improper application for payment, if corrected by the Contractor within seven (7) Days of being notified by the Owner, shall not cause a payment to be made later than specified in this section unless interest is also paid. Payment of interest will be postponed when payment on the principal is delayed because of disagreement between the Owner and the Contractor.

Owner reserves the right, instead of requiring the Contractor to correct or resubmit a defective or improper application for payment, to reject the defective or improper portion of the application for payment and pay the remainder of the application for such amounts which are correct and proper.

Owner, upon written notice to the Contractor, may elect to make payments to the Contractor only by means of Electronic Funds Transfers ("EFT") through Automated Clearing House ("ACH") payments. If Owner makes this election, the Contractor shall arrange for receipt of the EFT/ACH payments.

E.2.2 Contractor shall submit to the Owner an application for each payment and, if required, receipts or other vouchers showing payments for materials and labor including payments to Subcontractors. Contractor shall include in its application for payment a schedule of the percentages of the various parts of the Work completed, based on the Schedule of Values which shall aggregate to the payment application total, and shall include, on the face of each copy thereof, a certificate in substantially the following form:

"I, the undersigned, hereby certify that the above bill is true and correct, and the payment therefore, has not been received.

Signed: _____
Dated: _____"

E.2.3 Generally, applications for payment will be accepted only for materials that have been installed. Under special conditions, applications for payment for stored materials will be accepted at Owner's sole discretion. Such a payment, if made, will be subject to the following conditions:

(a) The request for stored material shall be submitted at least thirty (30) Days in advance of the application for payment on which it appears. Applications for payment shall be entertained for major equipment, components or expenditures only.

(b) The Contractor shall submit applications for payment showing the quantity and cost of the material stored.

(c) The material shall be stored in a bonded warehouse and Owner shall be granted the right to access the material for the purpose of removal or inspection at any time during the Contract Period.

(d) The Contractor shall name the Owner as co-insured on the insurance policy covering the full value of the property while in the care and custody of the Contractor until it is installed. A certificate noting this coverage shall be issued to the Owner.

(e) Payments shall be made for materials and equipment only. The submitted amount in the application for payment shall be reduced by the cost of transportation from the storage site to the Project Site and for the cost of an inspector to verify delivery and condition of the goods at the storage site. The cost of storage and inspection shall be borne solely by the Contractor.

(f) Within sixty (60) Days of the application for payment, the Contractor shall submit evidence of payment covering the material and/or equipment stored and of payment for the storage site.

(g) Payment for stored materials and/or equipment shall in no way indicate acceptance of the materials and/or equipment or waive any rights under the Contract for the rejection of the Work or materials and/or equipment not in conformance with the Contract Documents.

(h) All required documentation shall be submitted with the respective application for payment.

E.2.4 The Owner reserves the right to withhold all or part of a payment, or may nullify in whole or part any payment previously made, to such extent as may be necessary in the Owner's opinion to protect the Owner from loss because of:

(a) Work that is defective and not remedied, or that has been demonstrated or identified as failing to conform with Applicable Laws or the Contract Documents;

(b) third party claims filed or evidence reasonably indicating that such claims will likely be filed unless security acceptable to the Owner is provided by the Contractor;

(c) failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment (in which case Owner may issue checks made payable jointly to Contractor and such unpaid persons under this provision, or directly to Subcontractors and suppliers at any level under Section C.3.2);

(d) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;

(e) damage to the Work, Owner or Owner's agent;

(f) reasonable evidence that the Work will not be completed within the Contract Time required by the Contract, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

(g) failure to carry out the Work in accordance with the Contract Documents; or

(h) assessment of liquidated damages, when withholding is made for offset purposes.

E.2.5 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

(a) Take that portion of the Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Price allocated to that portion of the Work in the Schedule of Values, less retainage as provided in Section E.5. Pending final determination of cost to the Owner of changes in the Work, no amounts for changes in the Work can be included in applications for payment until the Contract Price has been adjusted by a Change Order;

(b) Add that portion of the Contract Price properly allocable to materials and equipment delivered and suitably stored at the Project Site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner pursuant to Section E.2.3, suitably stored off the Project Site at a location agreed upon in writing), less retainage as provided in Section E.5;

(c) Subtract the aggregate of previous payments made by the Owner; and

(d) Subtract any amounts for which the Owner has withheld or nullified payment as provided in the Contract Documents.

E.2.6 Contractor's applications for payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.

E.2.7 The Contractor warrants to Owner that title to all Work covered by an application for payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an application for payment all Work for which payments are received from the Owner shall be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided financing, labor, materials and equipment relating to the Work.

E.2.8 If Contractor disputes any determination by Owner with regard to any application for payment, Contractor nevertheless shall continue to expeditiously perform the Work. No payment made hereunder shall be or be construed to be final acceptance or approval of that portion of the Work to which such partial payment relates or shall relieve Contractor of any of its obligations hereunder.

E.3 PAYROLL CERTIFICATION REQUIREMENT

Owner's receipt of payroll certification pursuant to Section C.2 of the Contract shall be a condition precedent to Owner's obligation to pay any progress payments or final payment otherwise due.

E.4 DUAL PAYMENT SOURCES

Contractor shall not be compensated for Work performed under the Contract from any state agency other than the agency that is a party to the Contract.

E.5 RETAINAGE

E.5.1 Retainage shall be withheld and released in accordance with the requirements set forth in Local Contract Review Board Rules or the applicable County standard.

E.5.1.1 Owner may reserve as retainage from any progress payment an amount not to exceed five percent of the payment. As Work progresses, Owner may reduce the amount of retainage on or may eliminate retainage on any remaining monthly Contract payments after fifty (50) percent of the Work under the Contract is completed if, in the Owner's discretion, such Work is progressing satisfactorily. Elimination or reduction of retainage shall be allowed only upon written application by the Contractor, which application shall include written approval of Contractor's surety; except that when the Work is ninety-seven and a half percent (97.5%) completed in Owner's estimation, the Owner may, at its discretion and without application by the Contractor, reduce the retained amount to hundred (100) percent of the value of the Work remaining to be done. Upon receipt of written application by the Contractor, Owner shall respond in writing within a reasonable time.

E.5.1.2 If retainage is withheld, unless the Contractor requests and the Owner accepts a form of retainage described in options (a) or (b) below, the Owner (except as otherwise provided below for a contract of $500,000 or less), will deposit the retainage in an interest-bearing escrow account as required by ORS 279C.570(2). The Contractor shall execute such documentation and instructions respecting the interest-bearing escrow account as the Owner may require to protect its interests, including but not limited to a provision that no funds may be paid from the account to anyone without the Owner's advance written authorization. For a Contract over $500,000, if the Contractor requests that the Owner deposit the retainage in an interest-bearing account under ORS 279C.560(5), the Owner will use an interest-bearing escrow account as stated above. For a Contract of $500,000 or less, if the Contractor requests that the Owner deposit the retainage in an interest-bearing account under ORS 279C.560(5), the Owner will use an interest-bearing account (in a bank, savings bank, trust company or savings association) as provided under ORS 279C.450(5).

In accordance with the provisions of ORS 279C.560, Local Contract Review Board Rules, or the applicable County standard, unless the Owner finds in writing that accepting bonds, securities or other instruments described in option (a) below or a security bond described in option (b) below poses an extraordinary risk that is not typically associated with the bond, security or instrument, the Owner will approve the Contractor's written request:

a. to be paid amounts which would otherwise have been retained from progress payments where Contractor has deposited acceptable bonds, securities or other instruments of equal value with Owner or in a custodial account or other mutually-agreed account satisfactory to Owner, with an approved bank or trust company to be held in lieu of the cash retainage for the benefit of Owner. Interest or earnings on the bonds, securities or other instruments shall accrue to the Contractor. The Contractor shall execute and provide such documentation and instructions respecting the bonds, securities and other instruments as the Owner may require to protect its interests. To be permissible, the bonds, securities and other instruments must be of a character approved by Owner; or

b. that the Contractor be allowed, with the approval of the Owner, Owner allow Contractor to deposit a surety bond for the benefit of Owner, in a form acceptable to Owner, in lieu of all or a portion of funds retained, or to be retained. Such bond and any proceeds therefrom shall be made subject to all claims and liens in the manner and priority as set forth for retainage under ORS 279C.550 to ORS 279C.625.

When the Owner has accepted the Contractor's election of option (a) or (b), Owner may recover from Contractor any additional costs incurred through such election by reducing Contractor's final payment. Where the Owner has agreed to Contractor's request for option (b), Contractor shall accept like bonds from Subcontractors and suppliers on the Project from which Contractor has required retainages.

E. 5.1.3 The retainage held by Owner shall be included in and paid to the Contractor as part of the final payment of the Contract Price. The Owner shall pay to Contractor interest at the rate of two thirds of one percent per month on the final payment due Contractor, interest to commence forty-five (45) Days after the date which Owner receives Contractor's final approved application for payment and Work under the Contract has been completed and accepted and to run until the date when final payment is tendered to Contractor. The Contractor shall notify Owner in writing when the Contractor considers the Work complete and deliver to Owner its final application for payment and Owner shall, within fifteen (15) Days after receiving the written notice and the application for payment, either accept the Work or notify the Contractor of Work yet to be performed on the Contract. If Owner does not within the time allowed notify the Contractor of Work yet to be performed to fulfill contractual obligations, the interest provided by this subsection shall commence to run forty-five (45) Days after the end of the fifteen (15) Day period.

E.5.1.4 Owner will reduce the amount of the retainage if the Contractor notifies the Owner that the Contractor has deposited in an escrow account with a bank or trust company, in a manner authorized by the Owner, bonds and securities of equal value of a kind approved by the Owner and such bonds and securities have in fact been deposited.

E.5.1.5 Contractor agrees that if Contractor elects to reserve a retainage from any progress payment due to any Subcontractor or supplier, such retainage shall not exceed five percent of the payment, and such retainage withheld from Subcontractors and suppliers shall be subject to the same terms and conditions stated in Subsection E.5 as apply to Owner's retainage from any progress payment due to Contractor.

E.5.1.6 The Contractor shall comply with all applicable legal requirements for withholding and releasing retainage and for prompt payments, including but not limited to those in ORS Chapters 279C and 701, and 49 CFR 26.29.

E.6 FINAL PAYMENT

E.6.1 Upon completion of all the Work under the Contract, the Contractor shall notify the Owner, in writing, that Contractor has completed Contractor's obligations under the Contract and shall prepare its application requesting final payment. The amount of final payment will be the difference between the total amount due the Contractor pursuant to the Contract Documents and the sum of all payments previously made. Upon receipt of such notice and application for payment, the Owner will inspect the Work, and, if acceptable, submit to Contractor a recommendation as to acceptance of the completed Work and the final estimate of the amount due the Contractor. If the Work is not acceptable, Owner will notify Contractor within fifteen (15) Days of Contractor's request for final payment. Upon approval of this final application for payment by the Owner and compliance by the Contractor with

provisions in Section K, and Contractor's satisfaction of other provisions of the Contract Documents as may be applicable, the Owner shall pay to the Contractor all monies due under the provisions of these Contract Documents.

E.6.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner (1) 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, (2) 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, (3) consent of surety, if any, to final payment and (4), 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.

E.6.3 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final application for payment.

E.6.4 Contractor agrees to submit its final payment application within ninety (90) Days after Substantial Completion, unless written extension is granted by Owner. Contractor shall not delay final payment application for any reason, including without limitation nonpayment of Subcontractors, suppliers, manufacturers or others not a party to the Contract, or lack of resolution of a dispute with Owner or any other person of matters arising out of or relating to the Contract. If Contractor fails to submit its final payment application within ninety (90) Days after Substantial Completion, and Contractor has not obtained written extension by Owner, all requests or Claims for additional costs or an extension of Contract Time shall be barred.

SECTION F
PROJECT SITE CONDITIONS

F.1 USE OF PREMISES

Contractor shall confine equipment, storage of materials and operation of Work to the limits indicated by Contract Documents, Applicable Laws, permits or directions of the Owner. Contractor shall follow the Owner's instructions regarding use of premises, if any.

F.2 PROTECTION OF WORKERS, PROPERTY AND THE PUBLIC

F.2.1 Contractor shall maintain continuous and adequate protection of all of the Work from damage and shall protect the Owner, workers and property from injury or loss arising in connection with the Contract. Contractor shall remedy acceptably to the Owner any damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or caused by authorized representatives or personnel of the Owner. Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.

F.2.2 Contractor shall take all necessary precautions for the safety of all personnel on the Project Site or otherwise engaged in the undertaking of the Work and shall comply with the Contract Documents, best practices and all applicable provisions of federal, state and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for protection of workers and the public against any hazards created by construction. Contractor shall designate a responsible employee or associate on the Project Site, whose duty shall be the prevention of accidents. The name and position of the person designated shall be reported to the Owner. The Owner has no responsibility for Project Site safety. Project Site safety shall be the responsibility of the Contractor.

F.2.3 Contractor shall not enter upon private property without first obtaining permission from the property owner or its duly authorized representative. Contractor shall be responsible for the preservation of all public and private property along and adjacent to the Work contemplated under the Contract and shall use every precaution necessary to prevent damage thereto. In the event the Contractor damages any property, the Contractor shall at once notify the property owner and make, or arrange to make, full restitution. Contractor shall, immediately and in writing, report to the Owner, all pertinent facts relating to such property damage and the ultimate disposition of the claim for damage.

F.2.4 Contractor shall be responsible for protection of adjacent work areas including impacts brought about by activities, equipment, labor, utilities, vehicles and materials on the Project Site.

F.2.5 Contractor shall at all times direct its activities in such a manner as to minimize adverse effects on the environment. Handling of all materials shall be conducted so no release will occur that may pollute or become hazardous.

F.2.6 In an emergency affecting the safety of life or limb or of the Work or of adjoining property, the Contractor, without special instruction or authorization from the Owner, shall act reasonably to prevent threatened loss or injury, and shall so act, without appeal, if instructed by the Owner. Any compensation claimed by the Contractor on account of emergency work shall be determined in accordance with section D.

F.2.7 Contractor shall comply with all Owner safety rules and regulations, if applicable. Prior to commencement of any Work, Contractor and Subcontractors shall be required to complete an Owner Contractor Safety Orientation and submit all Owner required safety plans.

F.2.8 Contractor shall demonstrate that an employee drug testing program is in place.

F.3 CUTTING AND PATCHING

F.3.1 If applicable, Contractor shall be responsible for coordinating all cutting, fitting, or patching of the Work to make its several parts come together properly and fit to receive or be received by work of other contractors or Subcontractors shown upon, or reasonably implied by, the Contract Documents.

F.3.2 If applicable, Contractor shall be responsible for restoring all cut, fitted, or patched surfaces to an original condition; provided, however, that if a different condition is specified in the Contract Documents, then Contractor shall be responsible for restoring such surfaces to the condition specified in the Contract Documents.

F.4 CLEANING UP

From time to time as may be prudent or ordered by the Owner and, in any event, immediately after completion of the Work, the Contractor shall, at its own expense, clean up and remove all refuse and unused materials of any kind resulting from the Work. If Contractor fails to do so within twenty-four (24) hours after notification by the Owner the work may be

done by others and the cost charged to the Contractor and deducted from payment due the Contractor.

F.5 ENVIRONMENTAL CONTAMINATION

F.5.1. Contractor shall be held responsible for and shall indemnify, defend (with counsel of Owner's choice), and hold harmless Owner from and against any costs, expenses, damages, claims, and causes of action, or any of them, resulting from all spills, releases, discharges, leaks and disposal of environmental pollution, including storage, transportation, and handling during the performance of the Work or Contractor's obligations under the Contract which occur as a result of, or are contributed by, the negligence or actions of Contractor or its personnel, agents, or Subcontractors or any failure to perform in accordance with the Contract Documents (except to the extent otherwise void under ORS 30.140). Nothing in this section F.5.1 shall limit Contractor's responsibility for obtaining insurance coverages required under Section G.3 of the Contract, and Contractor shall take no action that would void or impair such coverages.

F.5.1.1 Contractor agrees to promptly dispose of such spills, releases, discharge or leaks to the satisfaction of Owner and regulatory agencies having jurisdiction in a manner that complies with Applicable Laws. Cleanup shall be at no cost to the Owner and shall be performed by properly qualified and, if applicable, licensed personnel.

F.5.1.2 Unless otherwise approved in the Solicitation Document, Contractor shall obtain the Owner's written consent prior to bringing onto the Project Site any (i) environmental pollutants or (ii) hazardous substances or materials, as the same or reasonably similar terms are used in any Applicable Laws. In any event, Contractor shall provide prior written notice to Owner when hazardous materials are brought on to the Project Site. The Contractor, at all times, shall:

(a) properly handle, use and dispose of all environmental pollutants and hazardous substances or materials on the Project Site, in accordance with all Applicable Laws;

(b) be responsible for any and all spills, releases, discharges, or leaks of (or from) environmental pollutants or hazardous substances or materials which Contractor has brought onto the Project Site; and

(c) promptly clean up and remediate, without cost to the Owner, such spills, releases, discharges, or leaks to the Owner's satisfaction and in compliance with all Applicable Laws.

F.5.2 Contractor shall report all reportable quantity releases, as such releases are defined in Applicable Laws. Upon discovery, regardless of quantity, Contractor must verbally report all releases to the Owner in a prompt manner. A written follow-up report shall be submitted to Owner within 48 hours of the telephonic report. Such written report shall contain, as a minimum:

(a) Description of items released (identity, quantity, manifest numbers, and any and all other documentation required by law).

(b) Whether amount of items released is EPA/DEQ reportable, and, if so, when reported.

(c) Exact time and location of release, including a description of the area involved.

(d) Containment procedures initiated.

(e) Summary of communications about the release between Contractor and State, local or federal officials other than Owner. Any communication to the press will be done by Owner and Contractor will defer to Owner.

(f) Description of cleanup procedures employed or to be employed at the Project Site, including disposal location of spill residue.

(g) Personal injuries, if any, resulting from, or aggravated by, the release.

F.6 ENVIRONMENTAL CLEAN-UP

F.6.1 Unless disposition of environmental pollution is specifically a part of the Contract, or was caused by the Contractor (reference F.5 Environmental Contamination), Contractor shall immediately notify Owner of any hazardous substance(s) which Contractor discovers or encounters during performance of the Work required by the Contract. "Hazardous substance(s)" means any hazardous, toxic and radioactive materials and those substances defined as "hazardous substances," "hazardous materials," "hazardous wastes," "toxic substances," or other similar designations in any federal, state, or local law, regulation, or ordinance, including without limitation asbestos, polychlorinated biphenyl ("PCB"), or petroleum, and any substances, materials or wastes regulated by 40 CFR, Part 261 and defined as hazardous in 40 CFR S 261.3. In addition to notifying Owner of any hazardous substance(s) discovered or encountered, Contractor shall immediately cease working in any particular area of the Project where a hazardous substance(s) has been discovered or encountered if continued work in such area would present a risk or danger to the health or wellbeing of Contractor's or any Subcontractor's work force, property or the environment.

F.6.2 Upon being notified by Contractor of the presence of hazardous substance(s) on the Project Site, not brought on to the Project Site by Contactor, Owner shall arrange for the proper disposition of such hazardous substance(s).

F.7 DEMOLITION

F.7.1 For demolition tasks, if any, the Contractor shall salvage or recycle construction and demolition debris, if feasible and cost-effective.

SECTION G
INDEMNITY, BONDING, AND INSURANCE

G.1 RESPONSIBILITY FOR DAMAGES / INDEMNITY

G.1.1 Contractor shall be responsible for all damage to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or result from, the carrying out of the Work to be done under the Contract, or from any act, omission or neglect of the Contractor, its Subcontractors, employees, guests, visitors, invitees and agents.

G.1.2 To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel approved by Owner) and hold harmless the Owner and its elected officials, officers, directors, agents, and employees (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses, demands and actions of any nature whatsoever which arise out of, result from or are related to: (a) any damage, injury, loss, expense, inconvenience or delay described in this Section G.1; (b) any accident or occurrence which happens or is alleged to have happened in or about the Project Site or any place where the Work is being performed, or in the vicinity of either, at any time prior to the time the Work is fully completed in all respects; (c) any failure of the Contractor to

observe or perform any duty or obligation under the Contract Documents which is to be observed or performed by the Contractor, or any breach of any agreement, representation or warranty of the Contractor contained in the Contract Documents or in any subcontract; (d) the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or any one of them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder (except to the extent otherwise void under ORS 30.140); and (e) any lien filed upon the Project or bond claim in connection with the Work. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section G.1.2.

G.1.3 In claims against any person or entity indemnified under Section G.1.2 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section G.1.2 shall not be limited on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

G.2 PERFORMANCE AND PAYMENT SECURITY; PUBLIC WORKS BOND

G.2.1 When the Contract Price is $50,000 or more, the Contractor shall furnish and maintain in effect at all times during the Contract Period a performance bond in a sum equal to the Contract Price and a separate payment bond also in a sum equal to the Contract Price. Contractor shall furnish such bonds even if the Contract Price is less than the above thresholds if otherwise required by the Contract Documents.

G.2.2 Bond forms furnished by the Owner and notarized by Contractor's surety company authorized to do business in Oregon are the only acceptable forms of performance and payment security, unless otherwise specified in the Contract Documents.

G.2.3 Before execution of the Contract, the Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Revised Statutes, Chapter 279C.830 and 279C.836, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond before permitting any Subcontractor to start Work.

G.3 INSURANCE

G.3.1 Primary Coverage: Insurance carried by Contractor under the Contract shall be the primary coverage. The coverages indicated are minimums unless otherwise specified in the Contract Documents.

G.3.2 Workers' Compensation: All employers, including Contractor, that employ subject workers who work under the Contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer's Liability Insurance with coverage limits of not less than the minimum amount required by statute for each accident. Contractors who perform the Work without the assistance or labor of any employee need not obtain such coverage if the Contractor certifies so in writing. Contractor shall ensure that each of its Subcontractors complies with these requirements. The Contractor shall require proof of such Workers' Compensation coverage by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors.

G.3.3 Builder's Risk Insurance:

G.3.3.1 Builder's Risk: During the term of the Contract, for new construction the Contractor shall obtain and keep in effect Builder's Risk insurance on an all risk forms, including earthquake and flood, for an amount equal to the full amount of the Contract, plus any changes in values due to modifications, Change Orders and loss of materials added. Such Builder's Risk shall include, in addition to earthquake and flood, theft, vandalism, mischief, collapse, transit, debris removal, and architect's fees "soft costs" associated with delay of Project due to insured peril. Any deductible shall not exceed $50,000 for each loss, except the earthquake and flood deductible which shall not exceed 2 percent of each loss or $50,000, whichever is greater. The deductible shall be paid by Contractor. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear.

G.3.3.2 Builder's Risk Installation Floater: For Work other than new construction, Contractor shall obtain and keep in effect during the term of the Contract, a Builder's Risk Installation Floater for coverage of the Contractor's labor, materials and equipment to be used for completion of the Work performed under the Contract. The minimum amount of coverage to be carried shall be equal to the full amount of the Contract. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear. Owner may waive this requirement at its sole and absolute discretion.

G.3.3.3 Such insurance shall be maintained until Owner has occupied the facility.

G.3.3.4 A loss insured under the Builder's Risk insurance shall be adjusted by the Owner and made payable to the Owner as loss payee. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner. The Owner shall have power to adjust and settle a loss with insurers.

G.3.4 General Liability Insurance:

G.3.4.1 Commercial General Liability: Upon execution of a Contract, Contractor shall obtain, and keep in effect at Contractor's expense for the term of the Contract, Commercial General Liability Insurance ("CGL") covering bodily injury and property damage in the amount of not less than $1,000,000 per claim and $2,000,000 per occurrence in a form satisfactory to Owner. This insurance shall include personal injury liability, products and completed operations, and contractual liability coverage for the indemnities provided under the Contract (to the extent contractual liability coverage for the indemnity is available in the marketplace), and shall be issued on an occurrence basis written on ISO Form GC 00 01 (12 04 or later) or an equivalent form approved in advance by Owner. The CGL shall provide separation of insured language. The policy or policies obtained by Contractor for purposes of fulfilling the requirements of this section shall be primary insurance with respect to the Owner. Any insurance or self-insurance maintained by the County shall be excess and shall not contribute to it.

G.3.4.2 Automobile Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of the Contract, Automobile Liability Insurance covering owned, and/or hired vehicles, as applicable. The coverage may be written in combination with the Commercial General Liability Insurance. Contractor shall provide proof of insurance of not less than $1,000,000 per claim and $2,000,000 per occurrence. Contractor

and its Subcontractors shall be responsible for ensuring that all non-owned vehicles maintain adequate Automobile Liability insurance while on Project Site.

G.3.4.3 Owner may adjust the insurance amounts required in Section G.3.4.1 and G.3.4.2 based upon institution specific risk assessments through the issuance of Supplemental General Conditions and a Contract.

G.3.4.4 To the extent that the Contract Documents require the Contractor to provide professional design services, design-build, or certifications related to systems, materials, or equipment, the Contractor shall (1) purchase and maintain professional liability/errors-and-omissions insurance with limits of not less than $1,000,000 for each claim and $2,000,000 general annual aggregate and (2) cause those Subcontractors (of any tier) who are providing professional design services including any design-build services to procure and maintain professional liability/errors-and-omissions insurance with limits of not less than $1,000,000 for each claim and $2,000,000 general annual aggregate. This policy shall be for the protection of the Owner, its elected officials, officers, agents and employees against liability for damages because of personal injury, bodily injury, death, or damage to property, including loss of use thereof, and damages because of negligent acts, errors and omissions in any way related to the Contract. The Owner, at its option, may require a complete copy of the above policy.

G.3.4.5 "Tail" Coverage: If any of the required liability insurance is arranged on a "claims made" basis, "tail" coverage will be required at the completion of the Contract for a duration of 36 months or the maximum time period available in the marketplace if less than 36 months. Contractor shall furnish certification of "tail" coverage as described or continuous "claims made" liability coverage for 36 months following Final Completion. Continuous "claims made" coverage will be acceptable in lieu of "tail" coverage, provided its retroactive date is on or before the effective date of the Contract. Owner's receipt of the policy endorsement evidencing such coverage shall be a condition precedent to Owner's obligation to make final payment and to Owner's final acceptance of Work or services and related warranty (if any).

G.3.4.6 Umbrella Liability (if required by Owner through issuance of Supplemental General Conditions): Contractor shall obtain, at Contractor's expense, and keep in effect during the term of the Contract, Umbrella liability Insurance over and above the general liability, automobile liability and workers' compensation coverage if required by Owner in specified limits at time of requirement.

G.3.4.7 Pollution Liability may be required by Owner through issuance of Supplemental General Conditions.

G.3.5 Additional Insured: The general liability insurance coverage, automobile liability, umbrella, and pollution liability if required, shall include the Owner as additional insureds but only with respect to the Contractor's activities to be performed under the Contract. The additional-insured endorsement for CGL insurance must be written on ISO Form CG 20 10 (10 01) and CG 20 37 (10 01), or their equivalent, but shall not use either of the following forms: CG 20 10 (10 93) or CG 20 10 (03 94). Proof of insurance must include a copy of the endorsement showing "Clackamas County, its elected officials, agents, officers, and employees" as scheduled insureds.

If Contractor cannot obtain an insurer to name the Owner as additional insureds, Contractor shall obtain at Contractor's expense, and keep in effect during the term of the Contract, Owners and Contractors Protective Liability Insurance, naming the Owner as additional insureds with not less than a $2,000,000 limit per occurrence. This policy must be kept in effect for 36 months following Final Completion. As evidence of coverage, Contractor shall furnish the actual policy to Owner prior to execution of the Contract.

G.3.6 Notice of Cancellation or Change: If the Contractor receives a non-renewal or cancellation notice from an insurance carrier affording coverage required herein, or receives notice that coverage no longer complies with the insurance requirements herein, Contractor agrees to notify Owner by fax within five (5) business days with a copy of the non-renewal or cancellation notice, or written specifics as to which coverage is no longer in compliance. When notified by Owner, the Contractor agrees to stop Work pursuant to the Contract at Contractor's expense, unless all required insurance remain in effect. Any failure to comply with the reporting provisions of this insurance, except for the potential exhaustion of aggregate limits, shall not affect the coverages provided to the Owner and its institutions, divisions, officers, and employees.

Owner shall have the right, but not the obligation, of prohibiting Contractor from entering the Project Site until a new certificate(s) of insurance is provided to Owner evidencing the replacement coverage. The Contractor agrees that Owner reserves the right to withhold payment to Contractor until evidence of reinstated or replacement coverage is provided to Owner.

G.3.7 Certificate(s) of Insurance/Insurance Carrier Qualification: As evidence of the insurance coverage required by the Contract, the Contractor shall furnish certificate(s) of insurance to the Owner prior to execution of the Contract. The certificate(s) will specify all of the parties who are additional insureds or loss payees for the Contract. A renewal certificate shall be sent to Owner at least 10 days prior to coverage expiration. Insurance coverage required under the Contract shall be obtained from insurance companies or entities acceptable to the Owner and that are eligible to provide such insurance under Oregon law. Eligible insurers include admitted insurers that have been issued a certificate of authority from the Oregon Department of Consumer and Business Services authorizing them to conduct an insurance business and issue policies of insurance in the state of Oregon, and certain non-admitted surplus lines insurers that satisfy the requirements of applicable Oregon law and which are subject to approval by the Owner. The Contractor shall be financially responsible for all deductibles, self-insured retentions and/or self-insurance included hereunder. Any deductible, self-insured retention and/or self-insurance in excess of $50,000 shall be subject to approval by the Owner in writing and shall be a condition precedent to the effectiveness of any Contract.

SECTION H
SCHEDULE OF WORK

H.1 CONTRACT PERIOD

H.1.1 Time is of the essence. The Contractor shall at all times carry on the Work diligently, without delay and punctually fulfill all requirements herein.

H.1.2 Notice to Proceed. Unless otherwise directed in the Contract Documents, Contractor shall commence Work on the Project Site within fifteen (15) Days of the Notice to Proceed. Notwithstanding the Notice to Proceed, Contractor shall not be authorized to proceed with the Work until all initial Contract requirements, including the Contract, performance bond and payment bond, and certificates of insurance, have been fully executed and submitted in a form acceptable to Owner.

H.1.3 Unless otherwise not required in the Construction Documents, Contractor shall participate in a pre-construction conference with the Owner's representative and designated design team. The

purpose of this pre-construction conference is to review the Contractor's proposed Schedule of Values and to review any other Project logistics to be coordinated between the parties.

H.1.4 Unless specifically extended by a Change Order, all Work shall be complete by the date contained in the Contract Documents. The Owner shall have the right to accelerate the completion date of the Work, which may require the use of overtime. Such accelerated Work schedule shall be an acceleration in performance of Work under Section D.1.2(f) and shall be subject to the provisions of Section D.1.

H.1.5 The Owner shall not waive any rights under the Contract by permitting the Contractor to continue or complete in whole or in part the Work after the date described in Section H.1.2 above.

H.2 SCHEDULE

H.2.1 Contractor shall provide, by or before the pre-construction conference, the initial as-planned schedule for review and acceptance by the Owner. The submitted schedule must illustrate Work by Project components, labor trades, and long lead items broken down by building and/or floor where applicable. If Owner shall so elect, Contractor shall provide the schedule in CPM format showing the graphical network of planned activities, including i) a reasonably detailed list of all activities required to complete the Work; ii) the time and duration that each activity will take to completion; and iii) the dependencies between the activities. Schedules lacking adequate detail, or unreasonably detailed, will be rejected. The schedule shall include the following: Notice to Proceed or the date the Work commences, if no Notice to Proceed is issued by Owner, Substantial Completion, and Final Completion. Schedules shall be updated monthly, unless otherwise required by the Contract Documents, and submitted with the monthly application for payment. Acceptance of the Schedule by the Owner does not constitute agreement by the Owner as to the Contractor's sequencing, means, methods, or durations. Any positive difference between the Contractor's scheduled completion and the Contract completion date is float owned by the Owner. Owner reserves the right to negotiate the float if it is deemed to be in Owner's best interest to do so. In no case shall the Contractor make a claim for delays if the Work is completed within the Contract Time but after Contractor's scheduled completion.

H.2.2 All Work shall be completed during normal weekdays (Monday through Friday) between the hours of 7:00 a.m. and 5:00 p.m. unless otherwise specified in the Contract Documents. Unless otherwise specified in the Contract Documents, no Work shall be performed during the following holidays:

- New Year's Day
- Martin Luther King Day
- Memorial Day
- Independence Day
- Labor Day
- Veterans Day
- Thanksgiving Day
- Christmas Day
- President's Day

When a holiday falls on a Sunday, the following Monday shall be recognized as a legal holiday. When a holiday falls on Saturday, the preceding Friday shall be recognized as a legal holiday.

H.3 PARTIAL OCCUPANCY OR USE

The Owner may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have reasonably accepted in writing the responsibilities assigned to each of them. Approval by the Contractor to partial occupancy or use shall not be unreasonably withheld. Immediately prior to such partial occupancy or use, the Owner and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

SECTION I
CORRECTION OF WORK

I.1 CORRECTION OF WORK BEFORE FINAL PAYMENT

The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects, and that the Work will conform to the requirements of the Contract Documents. Work failing to conform to these requirements shall be deemed defective. Contractor shall promptly remove from the premises and replace all defective materials and equipment as determined by the Owner, whether incorporated in the Work or not. Removal and replacement shall be without loss or expense to the Owner, and Contractor shall bear the cost of repairing all Work destroyed or damaged by such removal or replacement. Contractor shall be allowed a period of no longer than thirty (30) Days after Substantial Completion for completion of defective (Punch List) work. At the end of the thirty-day period, or earlier if requested by the Contractor, Owner shall arrange for inspection of the Work by the Architect/Engineer. Should the work not be complete, and all corrections made, the costs for all subsequent reinspections shall be borne by the Contractor. If Contractor fails to complete the Punch List work within the thirty (30) Day period, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand without affecting Contractor's obligations.

I.2 WARRANTY WORK

I.2.1 Neither the final certificate of payment nor any provision of the Contract Documents shall relieve the Contractor from responsibility for Defective Work and, unless a longer period is specified, Contractor shall correct all defects that appear in the Work within a period of one year from the date of issuance of the written notice of Substantial Completion by the Owner except for latent defects which will be remedied by the Contractor at any time they become apparent. The Owner shall give Contractor notice of defects with reasonable promptness. Contractor shall perform such warranty work within a reasonable time after Owner's demand and at Contractors sole expense. If Contractor fails to complete the warranty work within such period as Owner determines reasonable, or at any time in the event of warranty work consisting of emergency repairs, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand, without affecting Contractor's obligations. The Contractor shall perform the warranty Work by correcting defects within twenty-four (24) hours of notification by Owner, unless otherwise specified in the Contract Documents. Should the Contractor fail to respond within the specified response time, the Owner may, at its option, complete the necessary repairs using another contractor or its agents. If Owner completes the repairs using Owner's agent, Contractor shall pay Owner at the rate of one and one-half (1½) times the standard hourly rate of Owner's agent, plus related overhead and any direct non-salary costs. If Owner completes the repairs using another contractor, Contractor shall pay Owner the amount of Owner's direct costs billed by the other contractor for the work, plus the direct salary costs and related overhead and direct non-salary expenses of Owner's agents who

are required to monitor that contractor's work. Work performed by Owner using Owner's own agents or those of another contractor shall not affect the Contractor's contractual duties under these provisions, including warranty provisions.

I.2.2 Nothing in this Section I.2 provision shall negate guarantees or warranties for periods longer than one year including without limitation, such guarantees or warranties required by other sections of the Contract Documents for specific installations, materials, processes, equipment or fixtures.

I.2.3 In addition to Contractor's warranty, manufacturer's warranties shall pass to the Owner and shall not take effect until such portion of the Work covered by the applicable warranty has been accepted in writing by the Owner.

I.2.4 The one-year period for correction of Work shall be extended with respect to portions of Work performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work, and shall be extended by corrective Work performed by the Contractor pursuant to this Section, as to the Work corrected. The Contractor shall remove from the Project Site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

I.2.5 Nothing contained in this Section I.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the period for correction of Work as described in this Section I.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

I.2.6 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Price will be reduced as appropriate and equitable as determined by Owner. Such adjustment shall be effected whether or not final payment has been made.

SECTION J
SUSPENSION AND/OR TERMINATION OF THE WORK

J.1 OWNER'S RIGHT TO SUSPEND THE WORK

J.1.1 The Owner has the authority to suspend portions or all of the Work due to the following causes:

(a) Failure of the Contractor to correct unsafe conditions;

(b) Failure of the Contractor to carry out any provision of the Contract;

(c) Failure of the Contractor to carry out orders;

(d) Conditions, in the opinion of the Owner, which are unsuitable for performing the Work;

(e) Time required to investigate differing Project Site conditions; or

(f) Any reason considered to be in the public interest.

J.1.2 The Owner shall notify Contractor and the Contractor's Surety in writing of the effective date and time of the suspension, and Owner shall notify Contractor and Contractor's surety in writing to resume Work.

J.2 CONTRACTOR'S RESPONSIBILITIES

J.2.1 During the period of the suspension, Contractor is responsible to continue maintenance at the Project just as if the Work were in progress. This includes, but is not limited to, protection of completed Work, maintenance of access, protection of stored materials, temporary facilities, and clean-up.

J.2.2 When the Work is recommenced after the suspension, the Contractor shall replace or renew any Work damaged during the suspension, remove any materials or facilities used as part of temporary maintenance, and complete the Work in every respect as though its prosecution had been continuous and without suspension.

J.3 COMPENSATION FOR SUSPENSION

Depending on the reason for suspension of the Work, the Contractor or the Owner may be due compensation by the other party. If the suspension was required due to acts or omissions of Contractor, the Owner may assess the Contractor actual costs of the suspension in terms of administration, remedial work by the Owner's agents or another contractor to correct the problem associated with the suspension, rent of temporary facilities, and other actual costs related to the suspension, and any liquidated damages arising from the delay. If the suspension was caused by acts or omissions of the Owner, the Contractor may be due compensation which shall be defined using Section D, Changes in Work. If the suspension was required through no fault of the Contractor or the Owner, neither party shall owe the other for the impact.

J.4 OWNER'S RIGHT TO TERMINATE CONTRACT

J.4.1 The Owner may, without prejudice to any other right or remedy, and after giving Contractor seven (7) Days' written notice and an opportunity to cure, terminate the Contract in whole or in part under the following conditions:

(a) If Contractor should, voluntarily or involuntarily, seek protection under the United States Bankruptcy Code and Contractor as debtor-in-possession or the Trustee for the estate fails to assume the Contract within a reasonable time;

(b) If Contractor should make a general assignment for the benefit of Contractor's creditors;

(c) If a receiver should be appointed on account of Contractor's insolvency;

(d) If Contractor should repeatedly refuse or fail to supply an adequate number of skilled workers or proper materials to carry on the Work as required by the Contract Documents, or otherwise fail to perform the Work in a timely manner;

(e) If Contractor should repeatedly fail to make prompt payment to Subcontractors or for material or labor, or should disregard laws, ordinances or the instructions of the Owner;

(f) If Contractor is otherwise in breach of any part of the Contract; or

(g) If Contractor is in violation of Applicable Laws, either in the conduct of its business or in its performance of the Work.

J.4.2 At any time that any of the above occurs, Owner may exercise all rights and remedies available to Owner at law or in equity, and, in addition, Owner may take possession of the premises and of all materials and appliances and finish the Work by whatever method it may deem expedient. In such case, the Contractor shall not be entitled to receive further payment until the Work is completed. If

the Owner's cost of finishing the Work exceeds the unpaid balance of the Contract Price, Contractor shall pay the difference to the Owner.

J.5 TERMINATION FOR CONVENIENCE, NON-APPROPRIATION OF FUNDS, OR FORCE MAJEURE

J.5.1 Owner may terminate the Contract in whole or in part whenever Owner determines: (a) that termination of the Contract is in the best interest of Owner or the public; (b) that the Owner failed to receive funding, appropriations, allocations or other expenditure authority as contemplated by Owner's budget and Owner determines, in its sole determination, and its assessment and ranking of the policy objectives explicit or implicit in Owner's budget, Owner may determine it is necessary to and may terminate the Contract.; or (c) in the event of Force Majeure.

J.5.2 The Owner shall provide the Contractor with seven (7) Days prior written notice of a termination for Owner's or for public convenience. After such notice, the Contractor shall provide the Owner with immediate and peaceful possession of the premises and materials located on and off the premises for which the Contractor received progress payment under Section E. Compensation for Work terminated by the Owner under this provision will be according to Section E. In no circumstance shall Contractor be entitled to lost profits for Work not performed due to termination. If the Contract is terminated for public convenience, neither the Contractor not its Surety shall be relieved of liability for damages or losses suffered by the Owner as a result of defective, unacceptable or unauthorized Work completed or performed.

J.6 ACTION UPON TERMINATION

J.6.1 Upon receiving a notice of termination, and except as directed otherwise by the Owner, Contractor shall immediately cease placing further subcontracts or orders for materials, services, or facilities. In addition, Contractor shall terminate all subcontracts or orders to the extent they relate to the Work terminated and, with the prior written approval of the Owner, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts and orders.

J.6.2 As directed by the Owner, Contractor shall, upon termination, transfer title and deliver to the Owner all Record Documents, information, and other property that, if the Contract had been completed, would have been required to be furnished to the Owner.

J.6.3 Upon Owner's notice of termination pursuant to either Section J.4 or J.5, if Owner shall so elect, Contractor shall assign to the Owner such subcontracts and orders as Owner shall specify. In the event Owner elects to take assignment of any such subcontract or order, Contractor shall take such action and shall execute such documents as Owner shall reasonably require for the effectiveness of such assignment and Contractor shall ensure that no contractual arrangement between it and its subcontractors or suppliers of any tier or sub-tier shall prevent such assignment.

SECTION K
CONTRACT CLOSE OUT

K.1 RECORD DOCUMENTS

As a condition of final payment (refer also to section E.6), Contractor shall comply with the following: Contractor shall provide Record Documents for the entire Project to Owner. Record Documents shall depict the Project as constructed and shall reflect each and every change, modification, and deletion made during the construction. Record Documents are part of the Work and shall be provided prior to the Owner's issuance of final payment. Record Documents include all modifications to the Contract Documents unless otherwise directed.

K.2 OPERATION AND MAINTENANCE MANUALS

As part of the Work, Contractor shall submit two completed operation and maintenance manuals ("O & M Manuals") for review by the Owner prior to submission of any pay request for more than 75% of the Work. Owner's receipt of the O & M Manuals shall be a condition precedent to any payment thereafter due. The O & M Manuals shall contain a complete set of all submittals, all product data as required by the specifications, training information, telephone list and contact information for all consultants, manufacturers, installer and suppliers, manufacturer's printed data, record and shop drawings, schematic diagrams of systems, appropriate equipment indices, warranties and bonds. The Owner shall review and return one O & M Manual for any modifications or adjustments required. Prior to submission of its final pay request, Contractor shall deliver two (2) complete and approved sets of O & M Manuals in paper form and one (1) complete and approved set in electronic form to the Owner and Owner's receipt of the O & M Manuals shall be a condition precedent to Owner's obligation to make final payment.

K.3 COMPLETION NOTICES

K.3.1 Contractor shall provide Owner written notice of both Substantial and Final Completion. The certificate of Substantial Completion shall state the date of Substantial Completion, the responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and the time within which the Contractor shall finish all items on the Punch List accompanying the Certificate. Both completion notices must be signed and notarized by the Contractor and signed by the Architect/Engineer (if applicable) and Owner to be valid. The Owner shall provide the final signature on the notices. The notices shall take effect on the date they are signed by the Owner.

K.3.2 Substantial Completion of a facility with operating systems (e.g., mechanical, electrical, HVAC) shall be that degree of completion that has provided a minimum of thirty (30) continuous Days of successful, trouble-free operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the Owner. All equipment contained in the Work, plus all other components necessary to enable the Owner to operate the facility in the manner that was intended, shall be complete on the Substantial Completion date. The Contractor may request that a Punch List be prepared by the Owner with submission of the request for the Substantial Completion notice.

K.4 TRAINING

As part of the Work, and prior to submission of the final application for payment, the Contractor shall schedule with the Owner training sessions for all equipment and systems as required by the Contract Documents. Contractor shall schedule training sessions at least two weeks in advance of the date of training to allow Owner to provide its personnel with adequate notice. If assignments arise because of termination under Section J.4, then such assignments shall not relieve Contractor of liability hereunder. The O & M Manual shall be used as a basis for training. In addition to any off-Project Site training required by the Contract Documents, training shall include a formal session conducted at the Project Site after the equipment and/or system is completely installed and operational in its normal operating environment.

K.5 EXTRA MATERIALS

As part of the Work, Contractor shall provide spare parts, extra maintenance materials, and other materials or products in the quantities specified in the Contract Documents prior to final payment. Delivery point for extra materials shall be designated by the Owner.

K.6 ENVIRONMENTAL CLEAN-UP

As part of the Final Completion notice, or as a separate written notice submitted with or before the notice of Final Completion, the Contractor shall notify the Owner that all environmental and pollution clean-up, remediation and closure have been completed in accordance with all Applicable Laws and pursuant to the authority of all agencies having jurisdiction, and Contractor shall provide Owner with any and all documentation related to the same, including but not limited to directives, orders, letters, certificates and permits related to or arising from such environmental pollution. The notice shall reaffirm the indemnification given under Section F.5.1 above. Contractor's completion of its obligations under this Section K.6 and Owner's receipt of documents evidencing such completion shall be a condition precedent to Owner's obligation to make final payment.

K.7 CERTIFICATE OF OCCUPANCY

Owner's receipt of an unconditioned certificate of occupancy from the appropriate state and/or local building officials shall be a condition precedent to Owner's obligation to make final payment, except to the extent failure to obtain an unconditional certificate of occupancy is due to the fault or neglect of Owner.

K.8 OTHER CONTRACTOR RESPONSIBILITIES

The Contractor shall be responsible for returning to the Owner all property of Owner issued to Contractor during construction such as keys, security passes, Project Site admittance badges, and all other pertinent items. Upon notice from Owner, Contractor shall be responsible for notifying the appropriate utility companies to transfer utility charges from the Contractor to the Owner. The utility transfer date shall not be before Substantial Completion and may not be until Final Completion, if the Owner does not take beneficial use of the facility and the Contractor's agents continue with the Work.

The Owner's property is drug free and weapons free areas and the use of tobacco products is only allowed in designated areas. Contractor shall be required to ensure that its employees, Subcontractors and agents shall comply with these requirements.

SECTION L
GENERAL PROVISIONS

L.1 NO THIRD PARTY BENEFICIARIES

Owner and Contractor are the only parties to the Contract and are the only parties entitled to enforce its terms. Nothing in the Contract gives, is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly, or otherwise, to third persons unless such third persons are individually identified by name herein and expressly described as intended beneficiaries of the terms of the Contract.

L.2 SEVERABILITY

If any provision of the Contract is declared by a court to be unenforceable, illegal, or in conflict with any law, the validity of the remaining terms and provisions shall not be affected and the rights and obligations of the parties shall be construed and enforced as if the Contract did not contain the particular provision held to be invalid.

L.3 ACCESS TO RECORDS

L.3.1 Contractor shall keep, at all times on the Project Site, one record copy of the complete Contract Documents, including the Plans, Specifications, addenda, and Change Orders (if any) in good order and marked currently to record field changes and selections made during construction, and one record copy of Shop Drawings, Product Data, Samples and similar submittals, and shall at all times give the Owner access thereto.

L.3.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access, for a period not less than ten (10) years, to all Record Documents, financial and accounting records, and other books, documents, papers and records of Contractor which are pertinent to the Contract, including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts and transcripts. If for any reason, any part of the Work or the Contract shall be subject to litigation, Contractor shall retain all such records until all litigation is resolved and Contractor shall continue to provide Owner and/or its agents with full access to such records until such time as all litigation is complete and all periods for appeal have expired and full and final satisfaction of any judgment, order or decree is recorded and Owner receives a record copy of documentation from Contractor.

L.4 WAIVER

Failure of the Owner to enforce any provision of the Contract shall not constitute a waiver or relinquishment by the Owner of the right to such performance in the future nor of the right to enforce any other provision of the Contract.

L.5 SUCCESSORS IN INTEREST

The provisions of the Contract shall be binding upon and shall accrue to the benefit of the parties to the Contract and their respective permitted successors and assigns.

L.6 GOVERNING LAW

The Contract shall be governed by and construed in accordance with the laws of the State of Oregon without giving effect to the conflict of law provisions thereof.

L.7 APPLICABLE LAW

Contractor hereto agrees to comply in all ways with applicable local, state and federal ordinances, statutes, laws and regulations.

L.8 NON-EXCLUSIVE RIGHTS AND REMEDIES

Except as otherwise expressly provided herein, the rights and remedies expressly afforded under the provisions of the Contract shall not be deemed exclusive, and shall be in addition to and cumulative with any and all rights and remedies otherwise available at law or in equity. The exercise by either Party of any one or more of such remedies shall not preclude the exercise by it, at the same or different times, of any other remedies for the same default or breach, or for any other default or breach, by the other Party.

L.9 INTERPRETATION

The titles of the sections of the Contract are inserted for convenience of reference only and shall be disregarded in construing or interpreting any of its provisions.

L.10 DEBT LIMITATION

The Contract is expressly subject to the debt limitation of Oregon counties set forth in Article XI, Section 10, of the Oregon Constitution, and is contingent upon funds being appropriated therefore. Any provisions herein which would conflict with law are deemed inoperative to that extent.

L.11 LITIGATION

Any Claim between Owner and Contractor that arises from or relates to the Contract and that is not resolved through the Claims Review Process in Section D.3 shall be brought and conducted solely and exclusively within the Circuit Court of Clackamas County for the State of Oregon; provided, however, if a Claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. In no event shall this section be construed as a waiver by the County of any form of defense or

immunity, whether sovereign immunity, governmental immunity, immunity based on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court. CONTRACTOR, BY EXECUTION OF THE CONTRACT, HEREBY CONSENTS TO THE IN PERSONAM JURISDICTION OF THE COURTS REFERENCED IN THIS SECTION.

L. 12 SURVIVAL

All warranty, indemnification, and record retention provisions of the Contract, and all of Contractor's other obligations under the Contract that are not fully performed by the time of Final Completion or termination, and all other rights and obligations which by their context are intended to survive, shall survive Final Completion or any termination of the Contract.

L.13 ACCESS TO RECORDS

L.13.1. Contractor shall keep, at all times on the Work site, one record copy of the complete Contract Documents, including the Plans, Specifications, Construction Change Directives and addenda, in good order and marked currently to record field changes and selections made during construction, and one copy of Shop Drawings, Project Data, Samples and similar submittals, and shall at all times give the Owner access thereto.

L.13.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access, for a period not less than ten (10) years, to all Record Documents, financial and accounting records, and other books, documents, papers and records of Contractor which are pertinent to the Contract, including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts and transcripts. If for any reason, any part of the Work or this Contract shall be subject to litigation, Contractor shall retain all such records until all litigation is resolved and Contractor shall continue to provide Owner and/or its agents with full access to such records until such time as all litigation is complete and all periods for appeal have expired and full and final satisfaction of any judgment, order or decree is recorded and Owner receives a record copy of documentation from Contractor.

L.14 WAIVER

Failure of the Owner to enforce any provision of this Contract shall not constitute a waiver or relinquishment by the Owner of the right to such performance in the future nor of the right to enforce any other provision of this Contract.

L. 15 NO ATTORNEY FEES.

In the event any arbitration, action or proceeding, including any bankruptcy proceeding, is instituted to enforce any term of this Contract, each party shall be responsible for its own attorneys' fees and expenses.

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

PERFORMANCE BOND

Bond No.: 9406540
Solicitation: #2022-56
Project Name: Public Safety Training Center MAU and Exhaust Replacement

Fidelity and Deposit Company of Maryland	(Surety #1)	Bond Amount No. 1:	$643,900.00
N/A	(Surety #2)*	Bond Amount No. 2:*	$N/A
* *If using multiple sureties*		Total Penal Sum of Bond:	$643,900.00

We, Apex Mechanical, LLC as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Clackamas County, the sum of (Total Penal Sum of Bond) Six Hundred Forty-Three Thousand, Nine Hundred and 00/100 (Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety); and

WHEREAS, the Principal has entered into a contract with Clackamas County, along with the plans, specifications, terms and conditions of which are contained in the above-referenced Solicitation; and

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Performance Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and all authorized modifications of the Contract which increase the amount of the work, the amount of the Contract, or constitute an authorized extension of the time for performance, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal herein shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things undertaken by Contractor to be performed under the Contract, upon the terms set forth therein, and within the time prescribed therein, or as extended as provided in the Contract, with or without notice to the Sureties, and shall defend, indemnify, and save harmless Clackamas County and its elected officials, officers, employees and agents, against any direct or indirect damages or claim of every kind and description that shall be suffered or claimed to be suffered in connection with or

arising out of the performance of the Contract by the Principal or its subcontractors, and shall in all respects perform said contract according to law, then this obligation is to be void; otherwise, it shall remain in full force and effect for so long as any term of the Contract remains in effect.

Nonpayment of the bond premium will not invalidate this bond nor shall Clackamas County, be obligated for the payment of any premiums.

This bond is given and received under authority of Oregon Revised Statutes Chapter 279C and the Clackamas County Local Contractor Review Board Rules, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this 6th day of July, 2022.

PRINCIPAL: Apex Mechanical, LLC

By: _____
Signature

Member
Official Capacity

Attest: _____
Corporation Secretary

SURETY: Fidelity and Deposit Company of Maryland

[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

Amber Lynn Reese
Name

_____
Signature

800 Fifth Avenue, Suite 3800
Address

Seattle, WA 98104
City State Zip

(206) 622-1101 (206) 622-1405
Phone Fax

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

PAYMENT BOND

Bond No.: 9406540
Solicitation: #2022-56
Project Name: Public Safety Training Center MAU and Exhaust Replacement

Fidelity and Deposit Company of Maryland	(Surety #1)	Bond Amount No. 1:	$ 643,900.00
N/A	(Surety #2)*	Bond Amount No. 2:*	$ N/A
* *If using multiple sureties*		Total Penal Sum of Bond:	$ 643,900.00

We, Apex Mechanical, LLC, as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Clackamas County, the sum of (Total Penal Sum of Bond) Six Hundred Forty-Three Thousand, Nine Hundred and 00/100 (Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety); and

WHEREAS, the Principal has entered into a contract with Clackamas County, along with the plans, specifications, terms and conditions of which are contained in above-referenced Solicitation; and

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Payment Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and schedule of contract prices which are set forth in the Contract and any attachments, and all authorized modifications of the Contract which increase the amount of the work, or the cost of the Contract, or constitute authorized extensions of time for performance of the Contract, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things by it undertaken to be performed under said Contract and any duly authorized modifications that are made, upon the terms set forth therein, and within the time prescribed therein, or as extended therein as provided in the Contract, with or without notice to the Sureties, and shall defend, indemnify, and save harmless Clackamas County and its elected officials, officers, employees and agents, against any claim for direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Contractor or its subcontractors, and shall promptly pay all persons supplying labor, materials or both to the Principal or its subcontractors for prosecution of the work provided in the Contract; and shall promptly pay all contributions due the State Industrial Accident Fund and the State Unemployment Compensation Fund from the Principal or its subcontractors in connection with the performance of the Contract; and shall pay over to the Oregon Department of Revenue all sums required to be deducted and retained from the wages of employees of the Principal and its subcontractors pursuant to ORS 316.167, and

shall permit no lien nor claim to be filed or prosecuted against Clackamas County on account of any labor or materials furnished; and shall do all things required of the Principal by the laws of this State, then this obligation shall be void; otherwise, it shall remain in full force and effect for so long as any term of the Contract remains in effect.

Nonpayment of the bond premium will not invalidate this bond nor shall Clackamas County be obligated for the payment of any premiums.

This bond is given and received under authority of Oregon Revised Statutes Chapter 279C and the Clackamas County Local Contractor Review Board Rules, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES:

Dated this 6th day of July, 2022.

PRINCIPAL: Apex Mechanical, LLC

By: _____
Signature

member
Official Capacity

Attest: _____
Corporation Secretary

SURETY: Fidelity and Deposit Company of Maryland

[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

Amber Lynn Reese
Name

_____
Signature

800 Fifth Avenue, Suite 3800
Address

Seattle, WA 98104

City State Zip

(206) 622-1101 (206) 622-1405

Phone Fax

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by **Robert D. Murray, Vice President**, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **Linda Diane SHADDON, Dana Marie BRINKLEY, Tamara A. RINGEISEN, Kari Michelle MOTLEY, Misti Marie Brill, Donald Percell SHANKLIN, JR, Sara Sophie SELLIN, Michael S. MANSFIELD, Amber Lynn REESE of Portland, Oregon, EACH,** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings,** and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND,** this 04th day of February, A.D. 2021.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

Dawn E. Brown

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 04th day of February, A.D. 2021, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2023

Authenticity of this bond can be confirmed at bondvalidator.zurichna.com or 410-559-8790

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 6th day of July, 2022.

Brian M Hodges

By: Brian M. Hodges
Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
www.reportsfclaims@zurichna.com
800-626-4577

Authenticity of this bond can be confirmed at bondvalidator.zurichna.com or 410-559-8790

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT
PROJECT INFORMATION, PLANS, SPECIFICATIONS AND DRAWINGS

PROJECT: #2022-56 Public Safety Training Center MAU and Exhaust Replacement

Project Scope:
Clackamas County Facilities Management acting as a General Contractor is soliciting bids from qualified Contractors to replace existing Make-up air unit and Exhaust fan on roof of the Public Safety Training Center's shooting range. Utilizing associated HVAC supplies and materials to complete the job. Clackamas County will provide jobsite power and water. This contract will cover a complete replacement of existing MAU and Exhaust system serving the Public shooting range and the Law Enforcement range as covered in the attached engineering documents. Units will be set up, using DDC controls, to operate both ranges simultaneously as well as individually in accordance with the attached comprehensive Engineering packets.

DETAILED REQUIREMENTS

1. The contractor is responsible for providing a turn-key service for a complete replacement of a Make-up air unit and exhaust unit including all DDC, testing and balancing in accordance with included Engineering packet.
2. DDC will match existing building DDC (OrcaDelta via Delta Connects).
3. All electrical shall be done "In House".
4. The Contractor shall furnish the County with an industry standard written warranty for defects in work performed, covering parts, equipment and labor for the work being performed. The contractor shall also provide related operation manuals if any pertain and system operational training to designated County staff.
5. Care and diligence must be used to avoid any damages to the existing facility. Any damage incurred through the contractors operations will be the sole responsibility of the contractor. A limited staging area adjacent to the work area can be provided. The staging area, work site and all areas impacted or used by the contractor shall be clean and clear of construction materials at the end of the work shift.

Engineers Estimate: $650,000

Key Dates:
All Basic Bid Work may begin as soon as the Notice to Proceed ("NTP") is issued
Substantial Completion: January 1, 2023
Final Completion: June 30, 2023

The Scope further includes the following Plans, Specifications and Drawings:

- Clackamas County Public Safety Training Center- Firing Range HVAC Replacement- Division 23 Mechanical- March 2, 2022 (93 Pages)

- Clackamas County Public Safety Training Center- Firing Range HVAC Replacement- Division 26 Electrical- March 2, 2022 (38 Pages)
- Clackamas County PSTC- Roof Plan Drawing Set (2 pages)
- Clackamas County PSTC- HVAC Drawing Set (2 pages)
- Mechanical Compliance Certificate (9 pages)
- Clackamas County PSTC AHU Replacement Drawing Set- February 2022 (5 Pages)
- Structural Calculations for Clackamas County PSTC AHU Replacement- March 2, 2022 (43 pages)

Cundiff Engineering, Inc.
7007 S.W. Cardinal Lane, Suite 145
Portland, Oregon 97225
Telephone: 503.521 7260
Fax: 503.521 7257

Project: Clackamas County Public Safety Training Center - Firing Range HVAC Replacement
Project No.: 21-036
Date: March 02, 2022
By: Christopher M. Boyd, P.E.

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END OF TABLE OF CONTENTS

03/02/2022

SECTION 230050 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The intent of the Division 23 specifications and the accompanying drawings is to provide complete and workable systems as shown, specified and required by applicable codes. Include all work specified in Division 23 and shown on the accompanying drawings. The following requirements are included in this Section to expand the requirements specified in Division 01.

1.02 REFERENCES

A. FM: FM Global

B. NEMA: National Electrical Manufacturers Association

C. OR-OSHA: Oregon Occupational Safety and Health Administration

1.03 SUBMITTALS

A. Follow the procedures outlined below and as specified in Division 01.

B. Submit for approval, submittal documents as required in each Specification Section.
   1. Submit all shop drawings and product data grouped to include submittals of related systems, products, and accessories in a single electronic submittal in PDF format.
   2. Each submittal shall be indexed according to Specification Section.
   3. Each Specification Section shall be a separate file.
   4. Create PDFs at native size and right-side up; illegible files and secured files will be rejected.
   5. Mark dimensions and values in units to match those specified.
   6. Include equipment mark numbers matched to drawing schedules.
   7. If hard copies are specifically requested in Division 01, they shall be indexed according to Specification Section and bound in a three-ring binder.
   8. Provide sample start-up sheets for HVAC equipment.

C. No apparatus or equipment shall be shipped or fabricated until submittal documents for same have been reviewed and accepted.

D. Submittals not requested will not be recognized or reviewed.

E. Proposed Products List: In addition to the requirements of individual specification sections, include the following:
   1. Manufacturer's name and address
   2. Catalog designation or model number.
   3. Equipment schedule number (cross referenced from drawings).
   4. Rough-in data and dimensions
   5. Performance curves and related capacities
   6. Airborne noise levels.
   7. Detailed point-by-point control drawings, including manufacturers catalog numbers of all devices and description of all components cross referenced to the control drawings. Include sequence of operation.

1.04 QUALITY ASSURANCE

A. Materials and equipment shall be new. Work shall be of good quality, free of faults and defects.

B. All equipment shall fit in the space provided.

C. Systems shall be built and installed to deliver their full rated capacity at the efficiency for which they were designed.

D. HVAC systems shall operate at full capacity without objectionable noise or vibration.

E. Materials and Equipment:
   1. Each piece of equipment provided shall meet all detailed requirements of the drawings and specifications and shall be suitable for the installation shown.
   2. Where two or more units of the same class of equipment are provided, use products of the same manufacturer; component parts of the entire system need not be products of the same manufacturer.

F. Workmanship:
   1. Install all materials in a neat and workmanlike manner.
   2. Follow manufacturer's directions. If they are in conflict with the contract documents, obtain clarification before starting work.

G. Cutting and Patching:
   1. Cutting, patching and repairing for the proper installation and completion of the work specified in this division, including plastering, masonry work, concrete work, carpentry work, firestopping, and painting, shall be performed by skilled craftsmen of each respective trade in conformance with the appropriate division of work. Additional openings required in building construction shall be made by drilling or cutting.
   2. Fill holes which are cut oversize so that a tight fit is obtained around the objects passing through.
   3. Do not pierce beams or columns without permission of the Structural Engineer and then only as directed.
   4. New or existing work that is cut or damaged shall be restored to its original condition. Where alterations disturb existing finishes, the surfaces shall be repaired, refinished and left in condition existing prior to commencement of work.

1.05 SPECIFICATIONS COMPLIANCE

A. The requirements of these specifications shall be complied with in every respect. Therefore, it shall be mandatory that the job foreman, all lead mechanics, subcontractors and their foreman have completely studied these specifications, be completely knowledgeable as to their entire contents, and maintain a copy at the job-site. Failure to comply with this requirement will be reason to presume the foreman, lead mechanic or subcontractor is not in responsible charge of their work due to ignorance of job requirements, and will be reason for the Owner to require dismissal and replacement with approved personnel. Every foreman and lead mechanic shall be provided with a complete copy of this specification.

B. Enlarged scale plans, sections, and details shall take precedence over small scale plans.

1.06 STANDARD SPECIFICATIONS

A. The chemical and physical properties of all materials and the design performance characteristics and methods of construction of all items of equipment shall be in accordance with the requirements of the latest issue of the various applicable Standard Specifications at the time of bid.

1.07 CONTRACT DOCUMENTS

A. Contract Documents for Work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment, piping and approximate sizes and locations of equipment and outlets. They do not show every offset, bend, tee, or elbow which may be required to install work in the space provided and avoid conflicts. Do not scale the Contract Documents for measurements.

B. Outlets or equipment shown on the Drawings with no indication shall be completed in the same method and manner as similar outlets or equipment shown on the Drawings.

C. The Contractor shall follow the Contract Documents in laying out the work, to become familiar with all conditions affecting the work and shall verify all spaces in which the work will be installed.

D. Where job conditions require reasonable changes in indicated locations or arrangements, make changes without additional cost to the Owner.

E. The Contract Documents and Specifications are to be cooperative and whatever is called for by either shall be binding as if called for by both.

1.08 USE OF EQUIPMENT

A. The use of any equipment or any part thereof, for purposes other than startup and testing shall be prohibited.

1.09 PLACEMENT OF ORDERS

A. No consideration will be given to requests for substitutions because of delivery problems or failure to order equipment in a timely manner.

1.10 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 01. In addition to the requirements specified in Division 01, indicate the following installed conditions:

B. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., strainers, expansion compensators, tanks, etc.). Valve locations diagrams, complete with valve tag chart.

C. Equipment locations (exposed and concealed), dimensioned from prominent structural building lines.

D. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.11 OPERATION AND MAINTENANCE MANUALS (O&M)

A. Prepare operation and maintenance manuals in accordance with Division 01. In addition to the requirements specified in Division 01, include the following information for equipment items:
   1. O&M Manuals, including shop drawings, shall be indexed according to Specification Section.
   2. Each Specification Section and Drawing Discipline shall be a separate file.
   3. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   4. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   5. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.
   6. Servicing instructions and lubrication charts and schedules.

B. Maintenance manuals shall be submitted and approved prior to any system functional testing.

C. Manuals shall be project specific.

PART 2 PRODUCTS

2.01 PIPE AND DUCT SLEEVES

A. Interior Wall and Floor Sleeves: 18 gauge galvanized steel.

B. Exterior Wall Sleeves: Cast iron.

C. On-Grade Floor Sleeves: Cast iron.

2.02 FLOOR, WALL, AND CEILING PLATES

A. Provide stamped split-type escutcheon plates for piping as follows:
   1. Floor Plates: Cast brass, chromium plated.
   2. Wall and Ceiling Plates: Spun aluminum.

B. Provide stamped one-piece spun aluminum for round duct penetrations.

2.03 SEALANT

A. Sealants to be suitable for materials joined and application.

2.04 MACHINERY GUARDS

A. Provide guards for protection on all rotating and moving parts of equipment.

B. Provide shaft holes in guards for easy use of tachometers at shaft centers. Guards shall be easily removable.

C. All guards shall meet OR-OSHA requirements including back plates.

2.05 ELECTRICAL EQUIPMENT

A. General: All equipment and installed work shall be as specified under Division 26, Electrical.

B. Motors:
   1. Motors shall be furnished as integral part of driven equipment. Motors shall be completely enclosed, fan cooled induction type with sealed ball bearings. Motors 1 hp and above shall be NEMA Premium Efficiency type. Motors shall be built to NEMA standards for the service intended. The motors shall be rated for the voltage specified, suitable for operation within the range of 10 percent above to 10 percent below the specified voltage.
   2. Designed for a synchronous speed of 1800 rpm unless specified otherwise.
   3. Motors 1/2 hp and Larger: 3-phase, 60 cycle, 460V, service factor of 1.15, unless specifically noted otherwise.
   4. Motors 1/3 hp and Below: 1-phase, 60 cycle ac, 115V unless specifically noted otherwise, complete with integral thermal protection.
   5. Provide motors on belt drive equipment of nominal nameplate horsepower with not less than 120 percent of equipment brake horsepower required for performance specified.
   6. Have built-in thermal overload protection, or be protected externally with separate thermal overload devices with low-voltage release or lockout. Hermetically sealed motors shall have quick trip devices.
   7. Life expectancy of bearings shall exceed 100,000 hours of direct couple and 80,000 hours with belt.
   8. Motors controlled by variable speed drives shall be inverter duty rated and shall have a Class F insulation or better. Motors shall be able to withstand repeated voltage peaks of 1600 volts with rise times of 0.1 microseconds and greater, in accordance with NEMA Standard MG1, Part 31.
   9. Motors served from variable frequency drives shall be equipped with a shaft grounding system utilizing brush grounding kits to provide a path for current to flow between the shaft and the motor frame.
   10. Frequency drive manufacturers shall provide necessary filters and line reactor type equipment to protect motors from excessive voltage spikes that may exceed insulation requirements of NEMA MG1, Part 31.
   11. For motors 20 hp and greater, submit the following supplemental data:
      a. Number of stator slots.
      b. Number of rotor bars.
      c. Load current.
      d. Stator resistance.
      e. Stator configuration delta or wye.
      f. Bearing manufacturer and part numbers.
   12. Motors shall have a three year warranty.

C. Starters: See Division 26, Electrical. Starters shall be suitable for performing the control functions required, with the exception of self-contained equipment and where the starters are furnished as part of the control package.

D. Equipment Wiring: Interconnecting wiring within or on a piece of mechanical equipment shall be provided with the equipment unless shown otherwise. This does not include the wiring of motors, starters and controllers specified in Division 26, Electrical.

E. Control Wiring: All control wiring for HVAC equipment shall be as specified in Division 26.

2.06 SEALING

A. Seal below grade and between exterior piping and wall sleeves.

B. Use modular, elastomeric pipe sealing.
   1. Material: EPDM.
   2. Hardware: Stainless steel.
   3. Acceptable Manufactures: Link-seal or approved.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

A. Coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before fabricating work. Report changes in time to avoid unnecessary work.

3.02 COOPERATION WITH OTHER TRADES

A. The Contractor shall cooperate with other trades to avoid interferences in the work and to avoid delays in the construction.

B. Interference, which occurs as a result of poor coordination or lack of cooperation, shall be corrected at the Contractor's expense.

3.03 DAMAGE TO OTHER WORK

A. The Contractor shall be held responsible for damage done to existing equipment, structures, pipes, etc., which damage is a direct or indirect result of their work. Such damage will be repaired at the expense of the Contractor.

3.04 EXISTING SERVICES

A. When active sewers, gas, water, electric, telephone or other services are encountered in work, protect, brace or support, as required for proper execution of work. Do not disturb or prevent operation of active services that are to remain.

B. Existing utility interruptions are only permitted under the following conditions:
   1. Arrangement to provide temporary utility services, in accordance with Utility Provider's requirements.
   2. Notification to the Owner's Representative not less than seven days in advance of proposed interruptions.
   3. Owner's written permission for proposed interruption.

3.05 DEMOLITION AND SALVAGE

A. Remove or relocate piping, wiring, devices and other equipment encountered in existing areas affected by this work as indicated on the drawings. Status of items not indicated for demolition on the drawings shall be verified with the Owner's Representative.

B. Protect equipment identified to be salvaged. Remove salvaged equipment prior to demolition of adjacent services. Arrange with the Owner's Representative for storage and return of salvaged equipment.

C. Existing Services/Systems: Maintain services/systems indicated to remain and protect them

against damage during selective demolition operations. Prior to demolition, verify that demolished services will not affect the operation of existing systems that are to remain and notify the Engineer.

D. Demolition Service/System Requirements:
   1. Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical systems serving areas to be selectively demolished.
   2. Demolish all service back to nearest active main or point of future connection as indicated. Verify with Engineer extent of demolition prior to proceeding if extent is not clear.
   3. The Owner's representative will arrange to shut off indicated services/systems when requested by the Contractor.
   4. Where demolished systems contain refrigerant or another regulated chemical, the systems shall be drained with contents captured and properly disposed of prior to demolishing the system.
   5. If services/systems are required to be removed, relocated, or abandoned: Before proceeding with selective demolition, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   6. Remove all accessories associated with removed utilities including supports, hangers, braces, clips, etc., in their entirety.
   7. Patch penetrations of walls and floors related to demolished services restoring existing fire separations, assembly ratings, and waterproofing membranes.

3.06 SYSTEM WATER DISPOSAL

A. Do not drain water from systems treated with chemicals into the sanitary or storm sewers without written approval from the Owner's Representative.

3.07 REFERENCE TO DESIGN SCHEDULES

A. The Contractor shall refer to Equipment Schedules for Drawing unit identification number and corresponding area locations, capacity and design requirements.

B. After the equipment or materials have been installed and tested under operating conditions, if it is found that they do not meet the requirements specified, the Contractor shall remove all such equipment and/or materials that do not meet the specified conditions and replace them with the proper equipment without additional cost to the Owner.

3.08 EQUIPMENT INSTALLATIONS AND DESIGN

A. Certain equipment may need to be installed before enclosures are installed or completed. Doors and other access openings, in some case, may not be large enough to permit passage of the equipment completely assembled.

B. Investigate and coordinate these conditions prior to fabrication or shipment.

C. Make provisions for the necessary openings in the building to allow for admittance of all equipment.

D. Where two or more units of the same class of equipment are required, these units shall be the product of a single manufacturer.

E. Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with applicable technical standards, suitable for maximum working conditions and shall have a neat and finished appearance.

3.09 EQUIPMENT SCHEDULE

A. The Equipment specified is intended to indicate the quality and type of equipment to be supplied.

B. Where the Specifications vary from the schedules, the more stringent shall apply.

C. All packaged unit equipment and skid mounted HVAC components that are factory assembled shall meet, in detail, the products named and specified.

3.10 EQUIPMENT INSTALLATION

A. The Contractor shall coordinate the delivery of the equipment with other trades.

B. The Contractor shall provide the equipment in a suitable knocked down condition for placement in the structure as dictated by available access.

C. Any costs incurred by the failure of the Contractor to comply with the above shall be at the Contractor's expense.

3.11 SLEEVES

A. General:
   1. Lay out work prior to concrete forming. Do all cutting and patching required. Reinforce sleeves to prevent collapse during forming and pouring.
   2. Sleeve all core-drilled penetrations, unless detailed otherwise on the drawings.
   3. Sleeves shall be large enough to allow 3/4-inch clearance around pipe. When pipe is insulated, insulation shall pass continuously through sleeve with 3/4-inch clearance between insulation and sleeve.

B. Interior Wall Sleeves:
   1. Pack with fiberglass insulation.
   2. Terminate sleeve flush with face of wall unless indicated otherwise.

C. Above-Grade Exterior Wall Sleeves: Similar to interior wall sleeves, except caulk outside with sealant.

D. Sleeves Through Roof: Extend 8 inches above roof.

3.12 CLEANING

A. Clean HVAC equipment, piping and ductwork of stampings and markings (except those required by codes), iron cuttings, and other refuse.

B. Clean scratched or marred painted surfaces of rust or other foreign matter and paint with matching color industrial enamel, except as otherwise noted.

3.13 EQUIPMENT PROTECTION

A. Keep pipe, ductwork and conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect piping, conduit, ductwork, fixtures, equipment, and

apparatus against dirty water, chemical, or mechanical damage both before and after installation. Restore damaged or contaminated piping, fixtures, equipment, or apparatus to original conditions or replace at no additional cost to the Owner.

B. Protect bright finished shafts, bearing housings, and similar items until in service. No rust will be permitted.

C. Cover or otherwise suitably protect equipment and materials stored on the job site.

D. Provide filters at all openings in operating systems on return or exhaust ductwork.

3.14 ACCESSIBILITY

A. Conveniently locate control panels, hardware and devices, valves, thermometers, gauges, cleanout fittings, and other equipment or specialties requiring frequent reading, adjustments, inspection, repairs, or removal and replacement.

B. Install thermometers and gauges to be easily read from floors, platforms, and walkways.

3.15 FLOOR, WALL AND CEILING PLATES

A. Install plates on piping passing through finished walls, floors, ceilings, partitions and plaster furrings. Plates shall completely cover opening around pipe and duct.

B. Secure wall and ceiling plates to pipe, insulation, or structure.

C. Plates shall not penetrate insulation vapor barriers.

D. Plates are not required in mechanical rooms or unfinished spaces.

3.16 ELECTRICAL EQUIPMENT

A. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in the dedicated electrical space around electrical equipment.

B. The area above the dedicated electrical space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks, or breaks in such foreign systems.

C. Unions in mechanical piping shall not be installed in dedicated electrical or IT spaces, or above or below ceilings.

D. Low point drains in mechanical piping shall not be installed in dedicated electrical or IT spaces, or above or below ceilings. If this cannot be avoided, the low point drain connection shall be extended outside of the electrical or IT space.

E. Protect outdoor electrical equipment from accidental spillage or leakage from piping systems.

3.17 EQUIPMENT CONNECTIONS

A. Make final connections to equipment in accordance with manufacturer’s instructions, shop drawings, and as indicated.

B. Piping:
   1. Connections shall include hot and cold water, fuel and gas, compressed air, sanitary waste and vent, roof and overflow roof drains, and liquid grease.
   2. Provide easily accessible unions and gate valves in all piping at equipment, waste traps, and any other fittings required for complete installation.
   3. Piping connections shall be independently supported to prevent undue strain on equipment.

3.18 PAINTING

A. Comply with the requirements of Division 09.

B. Equipment Rooms and Finished Areas:
   1. Insulation: Not painted.
   2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Structural Steel Stands, Uninsulated Tanks, Equipment Bases: Paint one coat of black enamel.
   3. Steel Valve Bodies and Bonnets: Paint one coat of black enamel.
   4. Brass Valve Bodies: Not painted.
   5. Equipment Without Factory Finish: Paint one coat of grey machinery enamel. Do not paint nameplates.
   6. Grilles, Diffusers, Registers: Paint sheet metal and visible ductwork behind grilles, diffusers, and registers flat black.
   7. Galvanized Ductwork: Not painted.

C. Concealed Spaces (above ceilings, not visible):
   1. Insulation: Not painted.
   2. Hangers, Uninsulated Piping, Miscellaneous Iron Work, Valve Bodies and Bonnets: Not painted.

D. Exterior Black Steel: Wire brush and apply two coats of rust-inhibiting primer and one coat of grey exterior machinery enamel.

E. Roof Mounted Equipment: Paint two coats of exterior machinery enamel. Color as selected by the Owner's Representative.

F. Exterior ductwork: Paint two coats of exterior enamel suitable for material. Color as selected by the Owner's Representative.

3.19 POWDER-ACTUATED FASTENERS

A. Powder-actuated fasteners are not allowed.

3.20 ADJUSTING AND CLEANING

A. Before operating equipment or systems, make thorough check to determine that systems have been flushed and cleaned as required and equipment has been properly installed, lubricated, and serviced. Check factory instructions to see that installations have been made properly and that recommended lubricants have been used.

B. Use particular care in lubricating bearings to avoid blowing out seals from over-lubrication. Check equipment for damage that may have occurred during shipment, after delivery, or during installation. Repair damaged equipment or replace with new equipment when approved by the Owner's Representative.

3.21 COMMISSIONING

A. Complete all phases of work so the system, equipment, and components can be checked out, started, calibrated, operationally tested, adjusted, balanced, functionally tested, and otherwise commissioned. Complete systems, including all subsystems, so they are fully functional.

B. Perform commissioning in compliance with ASHRAE 90.1-2019 and ASHRAE Standard 202. Unless specified otherwise in the technical sections, provide factory startup services for the following items of equipment:
   1. Makeup air unit
   2. Exhaust fan
   3. Condensing unit
   4. Controls and associated motorized dampers

C. Participation in Commissioning: Provide skilled technicians to checkout, start up, calibrate, and test systems, equipment, and components.

D. Resolution of Deficiencies: Corrective work shall be completed to permit timely completion of the commissioning process. Experimentation to correct system performance will be permitted.

3.22 OPERATING INSTRUCTIONS

A. Instruct the Owner's personnel in the care, operation and maintenance of all apparatus and equipment. Instructions shall be given verbally at the job site by a qualified, experienced representative of the Contractor.

B. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use. Digital format to comply with Owner’s requirements.

END OF SECTION **230050**

SECTION 230529 – HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes the following:
   1. Hangers, supports, and anchors for equipment, tanks, ductwork, and piping systems.
   2. Supplementary steel for support or attachment of tanks, equipment, ductwork, and piping to general construction elements of the project.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230545, Mechanical Vibration and Seismic Controls

B. Section 230713, Mechanical Insulation

1.03 REFERENCES

A. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers
   1. ASHRAE Chapter 41: Absorption, Cooling, Heating, and Refrigeration Equipment

B. ASTM: American Society for Testing and Materials
   1. ASTM A36: Standard Specification for Carbon Structural Steel

C. CISPI: Cast Iron Soil Pipe Institute

D. OSSC: Oregon Structural Specialty Code

E. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association

1.04 SUBMITTALS

A. Product Data: For all products specified herein.

B. Shop Drawings:
   1. Submit shop drawings of Contractor-fabricated piping support structures, pipe racks, and anchors.
   2. Suspended Piping and Ductwork: Indicate point loads and support locations, along with applicable details keyed to layouts.
   3. Support Frames, Piping, Tank, and Equipment Supports, and Anchorage: Indicate point loads and support locations, along with applicable details keyed to the layouts pertaining to supports, support frames, and anchorages.
   4. Supplementary Steel: Show details of fabrication and installation to comply with Structural Drawings. Indicate materials, thicknesses, gauges, sizes, dimensions, methods of joining and fastening, welds, finishes, details of reinforcement and embedment, attachments, anchorages, miscellaneous metal items incidental to basic fabrication shown, provisions for work of other trades, and other pertinent information.

1.05 QUALITY ASSURANCE

A. Supports and hangers for piping systems subject to expansion and contraction shall be chosen with careful consideration. The hanger support type selection depends on the directions in which the piping system will expand.

PART 2 PRODUCTS

2.01 SUPPORTS AND ANCHORAGE

A. Provide pipe, ductwork, and equipment hangers and supports in accordance with the following:
   1. When supports and anchorages for tanks, equipment, conduit, piping, and ductwork are not shown on the drawings, the Contractor shall be responsible for their design.
   2. Supports and anchorages shall resist forces due to hydraulic testing and seismic forces as specified in the OSSC for the ground motion accelerations corresponding to the project location. Exterior equipment, ducts, and piping shall be designed to resist wind loads.
   3. Supports and anchorages shall not introduce stresses in the piping caused by thermal expansion or contraction.
   4. Connections to structural framing shall not introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Ductwork Hanger Materials: Galvanized sheet steel or Cadmium-plated steel rods and nuts.
   1. Hangers Installed in Corrosive Atmospheres: Stainless steel, all-thread rods.
   2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
   3. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
   4. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
   5. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

C. Fire/Smoke Resistance: Seismic- and wind-load-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.

D. Component Supports:
   1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.
   2. All component support attachments must comply with force and displacement resistance requirements of ASCE/SEI 7-16 Section 13.6.

2.02 SUPPORTS, GENERAL

A. Available Manufacturers: B-Line Systems, Anvil, Superstrut, Unistrut, or Approved.

B. Fabricate support members from welded standard structural shapes, pipe, and plate. Carry the necessary rollers, hangers, and accessories as required. Piping less than 4-inch pipe size may be supported from or by prefabricated roll-formed channels as specified in this section with necessary accessories to adequately support piping system.

C. Supports and Accessories: Preformed roll-formed channels and accessories with matching compatible accessories as shown, as specified, and as required.

D. Dissimilar Metal Protection: Cush-a-Strip, Hydra-Zorb cushions, B-line ISO pipe isolator, or Approved.

E. Attachments to roof and floor decks to support dead loads are not allowed except as described in Part 3. Attachments to decks to support transient loads shall consider the effects of deck deflection.

F. All exterior materials shall be hot-dip galvanized or stainless steel.

2.03 PIPE ATTACHMENTS

A. Clamps: MSS SP-58, Type 26, two bolt pipe strap clamp.

2.04 PIPE RACKS

A. Available Manufacturers: Superstrut, Uni-Strut, Cooper B-line or Approved.

B. Supports and Accessories: Preformed roll-formed channels and accessories with electrochromate or equivalent finish and matching compatible accessories as shown, as specified, and as required.

2.05 PROTECTION SHIELDS

A. Select protection shields based on actual outside diameter of pipe plus insulation. Use protection shields where hangers are installed around insulation, and on both sides of clamps or U-bolts where installed around insulation. Provide MSS SP-58, Type 40, Insulation protection shield.

2.06 BUILDING ATTACHMENTS

A. Beam Hangers – Beam Clamps: MSS SP-58, Type 30, adjustable malleable iron beam clamp, or MSS SP-58, Type 28 or 29, adjustable forged steel beam clamp.

B. Beam Hangers – C-Type Clamps: MSS SP-58, Type 19 or 23. Sized for required rod to support load being carried.

C. Beam Hangers – Welded: MSS SP-58, Type 22. Sized for required rod to support load being carried.

D. Post-installed concrete anchors:
   1. Mechanical Anchor Bolts:
      a. 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 for anchor and as tested according to ASTM E488/E488M.
   2. Adhesive Anchor Bolts:
      a. 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 E488/E488M.
   3. Provide post-installed concrete anchors that have been prequalified for use in wind-load applications. Post-installed concrete anchors must comply with all requirements of ASCE/SEI 7-16, Ch. 13.
      a. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.

b. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.

E. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC466 testing. Inserts to comply with MSS SP-58.

2.07 PIPE ANCHORS

A. Fabricate from steel plate as detailed by the Engineer. Use of premanufactured pipe anchors is acceptable when designed for by the Engineer.

2.08 ROOF-MOUNTED EQUIPMENT SUPPORT

A. Welded aluminum or galvanized steel construction suitable for use on insulated or non-insulated flat roof decks, wood nailer, engineered to support gravity and seismic loads of supported equipment. Account for roof slope to provide level mounting surface for equipment.

PART 3 EXECUTION

3.01 HANGERS AND SUPPORTS

A. General:
1. Install all support systems as detailed and in accordance with manufacturer's recommendations. Provide pipe racks, pipe stands, trapeze hangers, etc., as required and as detailed on the drawings.
2. Provide adjustable hangers complete with inserts, adjusters, bolts, nuts, swivels, all-thread rods, etc., for all pipes, except where specified otherwise.
3. Size hangers to clear insulation for piping services conveying liquids less than 70ºF.
4. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods. Do not use tape for isolation.
5. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
6. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

B. Ductwork hangers and supports:
1. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
2. Support vertical ducts at maximum intervals of 16 feet and at each floor.
3. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

C. Vertical Piping:
   1. Support with U-clamps fastened to wall to hold piping away from wall unless otherwise approved.

D. Horizontal Piping:
   1. Install hangers outside of insulation, provide insulation protection shields at each hanger location.

E. Trapeze Hangers: Multiple pipe runs where indicated shall be supported on channels with rust resistant finish. Provide all necessary supporting steel.
   1. Channels: Unistrut with electro-chromate finish, or equal.

F. Hanger Spacing: Provide hangers at minimum spacing in accordance with Chapter 41, ASHRAE Guide and as follows:
   1. Steel Pipe, Copper Tubing: For straight runs of horizontal piping with no concentrated loads such as valves, flanges, expansion joints, or other components. Sections of piping with concentrated loads will have to be considered carefully and a determination made as to appropriate spacing and rod size for the given situation.

Pipe Size	Max. Span Steel	Max. Span Copper	Rod Size
1" and smaller	7 feet	5 feet	3/8"
1-1/4" to 2"	8 feet	7 feet	3/8"
2-1/2" to 3"	11 feet	9 feet	1/2"

   2. Maximum Rod Load: Below are maximum loads for hanger rods based on Chapter 41 of ASHRAE Guide and as follows for ASTM A36, with a safety factor of 5.

Nominal Rod Diameter	Load
3/8"	610 pounds
1/2"	1,130 pounds
5/8"	1,810 pounds
3/4"	2,710 pounds
7/8"	3,770 pounds
1"	4,960 pounds

G. Insulation Protection:
   1. Where piping is suspended from insulation, provide 16-gauge galvanized steel protection shields, 12 inches long.
   2. Where pipe clamps are installed on insulated piping, provide 16-gauge galvanized steel protection shields, 12 inches long on both sides of insulated pipe.
   3. Band shields firmly to insulation to prevent slippage.

H. Building Attachments:
   1. Where possible, support all piping and equipment from structural members, beams, and joists. 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.
   2. Provide structural steel angles, channels, or other members to support piping and equipment where structural members do not occur as required for proper support.

3. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points or provide web reinforcing as required.
4. Piping Restraints:
   a. Comply with requirements in MSS SP-127.
   b. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
   c. Brace a change of direction longer than 12 feet.
   d. Bracing shall not introduce stresses in the piping system caused by thermal expansion or contraction.
5. Mechanical Anchor Bolts:
   a. 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 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.
   b. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   c. Wedge-Type Anchor Bolts: 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.
   d. Adhesive-Type Anchor Bolts: 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.
   e. Set anchors to manufacturer's recommended torque, using a torque wrench.
   f. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

I. Pipe Racks:
   1. General: Provide racks as shown with additional elements to adequately support piping.
   2. Coordination: Where mechanical piping, tubing, etc., and electrical conduit, wiremold, wireways, etc., follow common routings, coordinate routing. Allow sufficient clearance to adequately operate, access, and maintain all devices without dismantling racks.

J. General: Support all piping within 2 feet of change of direction on both sides of fitting.

K. Roof-Mounted Equipment Supports: Select appropriate model for insulated or uninsulated roof deck. Install in accordance with manufacturer’s instructions. Account for roof slope to provide level mounting service for equipment.

END OF SECTION **230529**

SECTION 230548 – MECHANICAL VIBRATION AND SEISMIC CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes seismic restraints for piping, ductwork, conduit, and equipment, including clamps, rods, channels, struts, anchor bolts, nuts, and accessories.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230529, Hangers and Supports

B. Section 233113, HVAC Ductwork

1.03 REFERENCES

A. AISC: American Institute of Steel Construction
   1. AISC Steel Construction Manual

B. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers

C. ASTM: American Society for Testing and Materials
   1. ASTM A36: Standard Specification for Carbon Structural Steel

D. AWS: American Welding Society
   1. AWS D1.1: Structural Welding Code – Steel, 2010

E. OSSC: Oregon Structural Specialty Code

1.04 GUIDELINES

A. Seismic Restraint: Conform with the requirements of Section 230529, Hangers and Supports and additional requirements specified herein for seismic restraint of vibration isolated equipment, ductwork, and piping.

1.05 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing complete details of construction for steel and concrete bases including:
   1. Equipment mounting holes.
   2. Dimensions.
   3. Isolation selected for each support point.
   4. Details of mounting brackets for isolator.
   5. Weight distribution for each isolator.
   6. Details of seismic snubbers.
   7. Code number assigned to each isolator.

B. Product Data: Submit product data sheets for isolators, showing:
   1. Size, type, load and deflection of each required isolator.

C. Installation Procedures: Submit procedures for setting and adjusting isolation devices.

D. Installation Report: Submit installation report as specified in Part 3 of this section.

1.06 QUALITY ASSURANCE

A. Except for packaged equipment with integral isolators, a single manufacturer shall select and furnish all isolation required.

B. Isolation performance requirements shall be as indicated on the drawings. All deflections indicated shall be minimum actual static deflections for specific equipment supported.

C. Supports, Hangers, and Anchors: Comply with the requirements of Section 230529, Hangers and Supports.

PART 2 PRODUCTS

2.01 MATERIALS

A. Seismic Bracing: Steel fabrication, in accordance with AISC Steel Construction Manual, with structural steel shapes of ASTM A36 steel. Weld in accordance with AWS D1.1-10. Fastenings, bracing, and assembly shall be per Structural Drawings.

B. Channel type elements shall be No. 12 gauge formed steel; 1 5/8-inch square prime painted or chromate dip finish. Use spring-in nuts with grooves.

C. Bolting accessories shall be machine bolts with semi-finished nuts.

2.02 TYPE 1 - NEOPRENE WAFFLE PAD

A. Neoprene waffle pads with pattern repeating on 1/2-inch centers. Minimum 1/4-inch thick with additional thickness as required for uniform loading over pad area.

B. Select durometer stiffness for maximum deflection at average load rating.

C. Acceptable Manufacturers: Mason type “W,” CADDY, Vibration Mountings & Controls, Kinetics Noise Control, California Dynamics Corporation, or approved.

2.03 TYPE 2 - RESTRAINED DOUBLE DEFLECTION NEOPRENE

A. Restrained double deflection neoprene mountings with minimum actual static deflection of 0.35 inches for equipment supported.

B. Friction pad both top and bottom.

C. Steel rails used above those mountings of equipment with overhang.

D. Manufacturers: Mason type RCA, CADDY, Vibration Mountings & Controls, Kinetics Noise Control, California Dynamics Corporation, or approved.

2.04 TYPE 3 - SPRINGS

A. Free-standing springs without housings.

B. 1/4-inch neoprene acoustical friction pads between base plate and support.

C. All mountings shall have leveling bolts.

D. Springs mounted outboard of channels.

E. Manufacturers: Mason type SLF, CADDY, Vibration Mountings & Controls, Kinetics Noise Control, California Dynamics Corporation, or approved.

2.05 TYPE 4 - SPRINGS WITH RESTRAINTS

A. Same as springs except seismic restraints shall be added.

B. Seismic restraint an integral part of isolator.

C. Isolator, snubber, and base shall be rated to withstand a minimum 1G seismic force in all directions.

D. Manufacturers: Mason type SLR with seismic restraints, CADDY, Vibration Mountings & Controls, Kinetics Noise Control, California Dynamics Corporation, or approved.

2.06 SEISMIC RESTRAINTS

A. Provide seismic restraints for all vibration isolated equipment, both supported and suspended, and all vibration isolated ductwork and piping. Refer to Section 230529, Hangers and Supports; and Section 233113, HVAC Ductwork for additional and specific requirements, along with Structural Drawings.

PART 3 EXECUTION

3.01 GENERAL

A. Do not install any equipment, duct, or pipe which makes rigid contact with the building other than at points of support. “Building” includes slabs, beams, studs, walls, etc.

B. The installation or use of vibration isolators shall not cause any change of position of equipment or piping which would result in stresses to piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. Do not transfer the load to the isolator until the installation is complete and under full operational load.

3.02 PREPARATION

A. Treat all isolators, including springs, brackets, and housing, with a rustproof metal primer.

B. Coat items exposed to weather with cadmium plating, galvanizing, or plastic coating.

3.03 INSTALLATION

A. Equipment and tanks shall be braced or anchored to conform to the requirements listed under the Quality Assurance article of this section.

B. Ductwork and piping shall be seismically braced to conform to the requirements listed under the Quality Assurance article of this section.

C. Provide ductwork seismic flexible connectors where ductwork crosses building earthquake joints. Arrange ductwork and connectors for the amount of motion required.

D. Powder-actuated inserts are not allowed.

E. Attach seismic restraints to structural members of the building which are capable of withstanding the design load of the seismic restraint. Ensure load capacity of the structural members is greater than or equal to the capacity of the seismic restraint.

F. Seismic restraints shall not introduce stresses in piping caused by thermal expansion or contraction.

3.04 INSTALLATION

A. General:
   1. Install isolation where indicated on the drawings by type and location and where indicated below. For all other equipment with rotating parts or motors, isolation and minimum static deflections shall comply with the ASHRAE Handbook, HVAC Applications, Sound and Vibration Control.
   2. Mark the assigned code number on the isolators and bases to assure placement in the proper location.
   3. Anchor baseplates to floor. Provide rubber grommets and washers to isolate the bolt from the base plate. Under no circumstances shall the isolation efficiency be destroyed when bolting the isolators to the floor.

B. Isolation of Pipe and Ductwork:
   1. Install isolating hangers on all ductwork, and water piping connected to air handling units or other rotating equipment in mechanical rooms and within 40 feet of equipment. Provide isolating hanger supports for each piece of isolated equipment outside of mechanical rooms and where indicated. Isolators within 25 feet of equipment shall have a static deflection of 1 inch. Beyond 25 feet, isolators shall have a static deflection of 1/2 inch.
   2. Ductwork or piping supported from floor shall be isolated with Type 1 isolators.

C. HVAC Equipment:
   1. Provide isolation between equipment housing / support rails and structural support.
   2. Where unit is bolted to structural supports, isolate bolts with neoprene washers and bushings.

3.05 SEISMIC RESTRAINTS (VIBRATION ISOLATED EQUIPMENT, DUCTWORK AND PIPING)

A. General: Install and adjust seismic restraints so that the equipment and piping vibration isolation is not degraded by the restraints.

B. Supported Equipment:
   1. Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.
   2. Take care so that a minimum 1/8-inch air gap in the seismic restraint snubber is preserved on all sides so that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

3.06 ELECTRICAL COORDINATION

A. Make all electrical connections to isolated equipment using flexible electrical conduit. No conduit clamps or hangers shall be used between the flexible conduit and equipment. Provide non-stressed loop in conduit, unrestrained in all directions.

3.07 FIELD QUALITY CONTROL

A. Confirm that all isolation is installed correctly and submit report stating that isolators are installed as shown on shop drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

END OF SECTION **230548**

SECTION 230553 – MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes the identification of valves, piping, ductwork, and equipment components of the mechanical systems to indicate their function and system served.

1.02 REFERENCES

A. ANSI: American National Standards Institute

1.03 SUBMITTALS

A. Product Data: For all products specified herein.

B. Valve Tag Directory: Submit for approval prior to fabrication of valve tags.

C. Equipment Nameplate Directory: Submit for approval prior to fabrication of labels.

D. Include copy of valve tag and equipment nameplate directories in each set of operation and maintenance manuals.

PART 2 PRODUCTS

2.01 VALVE IDENTIFICATION

A. Valve Tags:
   1. General: Identify valves with metal tags. Legends shall be stamped or embossed. Tags shall indicate the function of the valve and its normal operating position.
   2. Size: Valve tags 2-inch diameter with 1/4-inch-high letters.
   3. Material: Use 0.050 or 0.064-inch brass tags.
   4. Existing Buildings and Systems: Contact the Owner's Representative for coordination with existing building tagging system and supplementary information required for any specific system before valve tagging begins.

B. Valve Tag Directory: Include tag number, location, exposed or concealed, service, valve size, valve manufacturer, valve model number, tag material, and normal operating position of valve.

2.02 PIPING MARKERS

A. Acceptable Manufacturers: W. H. Brady, Seton, Marking Systems, Inc. (MSI), or Approved.

B. Label pipes with all-vinyl, self-sticking labels or letters. For pipe covering sizes up to and including 3/4-inch outside diameter, select labels with 1/2-inch letters. For sizes from 3/4- to 2-inch outside diameter, 3/4-inch letters; above 2 inches outside diameter, 2-inch letters. The pipe markers shall be identified and color coded in compliance with ANSI 13.1-2015 Standard.

2.03 EQUIPMENT IDENTIFICATION

A. Nameplates:
   1. Tag all mechanical equipment with engraved nameplates. Nameplates shall be 1/16-inch-thick, 3 x 5 laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
   2. Identify unit with code number as shown on drawings and area served.

B. Equipment Nameplate Directory: List pumps, air handlers, terminal units, and other equipment nameplates. Include Owner- and Contractor-furnished equipment. List nameplate designation, manufacturer's model number, location of equipment, area served or function, disconnect location, and normal position of HOA switch.

C. Thermostat, Sensor labels:
   1. Tag all thermostats and sensors of mechanical equipment with engraved nameplates. Nameplates shall be 1/16-inch-thick, minimum 1" x 2" laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
   2. Identify unit with code number as shown on drawings.

D. Control equipment:
   1. Tag all control equipment and accessories with engraved nameplates. Nameplates shall be 1/16-inch-thick, minimum 1" x 2" laminated 3-ply plastic, center ply white, outer ply black. Form letters by exposing center ply.
      a. Minimum letter size shall be the following:
         1) 0.5-inches: DDC Controllers, Gateways, Repeaters, Enclosures, UPS units.
         2) 0.25-inches: Electrical Power Devices, Accessories, Instruments, Control dampers, and valve actuators.
   2. Tag shall be fastened with drive pins.

PART 3 EXECUTION

3.01 VALVE IDENTIFICATION

A. Valve Tags:
   1. Attach to valve with a brass chain.
   2. Number valves per direction of the Owner's Representative.

B. Valve Tag Directory: Post final copy in operation and maintenance manual.

C. Concealed Valves: Affix color coded "dot" to walls or ceilings wherever valves are concealed. Colors shall be as follows:
   1. HVAC Blue

3.02 PIPING MARKERS

A. Unless recommendations of ANSI A13.1 are more stringent, apply labels or letters after completion of pipe cleaning, insulation, painting, or other similar work, as follows:
   1. Every 20 feet along continuous exposed lines.
   2. Every 10 feet along continuous lines in mechanical rooms and other areas of congested piping and equipment.
   3. Adjacent to each valve and stubout for future.
   4. Where pipe passes through a wall, into and out of concealed spaces.
   5. On each riser.

6. On each leg of a “T.”
7. At access doors, manholes and similar access points that permit view of concealed piping.
8. Locate conspicuously where visible.

B. Further, apply labels or letters to lower quarters of the pipe on horizontal runs where view is not obstructed or on the upper quarters when pipe is normally viewed from above. Apply arrow labels indicating direction of flow.

C. Spray a protective coating of clear epoxy over markers and arrows in corrosive atmosphere areas.

3.03 EQUIPMENT IDENTIFICATION

A. Nameplates: Attach to prominent area of equipment, either with sheet metal screws, brass chain, or contact cement as applicable.

B. Nameplate Directory: Post final copy in operation and maintenance manual.

C. HVAC Equipment Installed Above T-Bar Ceiling: Label T-bar grid with mechanical equipment identifier as shown on the drawings. Use T-bar labels and attach with contact cement.

3.04 THERMOSTATS AND SENSORS

A. Label each thermostat/sensor with associated unit identifier on inside of cover as shown on the drawings. Use sensor labels and attach with contact cement.

END OF SECTION **230553**

SECTION 230593 – TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes adjustment, testing, and balancing of air systems, and miscellaneous mechanical equipment.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230900, Instrumentation and Controls

1.03 REFERENCES

A. AABC: Associated Air Balance Council

B. NEBB: National Environmental Balancing Bureau

1.04 SUBMITTALS

A. Submit the following:
   1. Balancing Log: Include all air and water outlets, actual field-measured air volume and percentage of design volumes. Provide drawings identifying locations of all outlets.
   2. Equipment Data Sheets: Indicate actual equipment performance, model numbers, bearing and belt data, motor nameplate data, and final balanced motor data.
   3. Additional Data: Submit all additional data as provided by AABC or NEBB Standard forms.
   4. Instrument Certification: When requested, submit certificate of calibration for all equipment to be used.
   5. Adjustment and Balancing Plan and Schedule.

1.05 QUALITY ASSURANCE

A. Acceptable Testing, Adjustment, and Balancing Firms:
   1. Air Balancing Specialty, Inc.
   2. Neudorfer Engineers, Inc.
   3. Northwest Engineering, Inc.
   4. Or Approved.

B. Industry Standards: Testing, adjustment, and balancing shall be conducted in a manner recognized by the AABC or NEBB and recorded on forms similar to those published by the AABC or NEBB.

C. Instrument Certification: All instruments used shall be accurately calibrated and certified within six months of balancing and maintained in good working order.

D. Test Observation: If requested, conduct tests in the presence of the Owner's Representative.

E. Pre-Balancing Conference: TAB contractor shall schedule and hold conference with Owner's Representatives to review balancing plan prior to starting work.

1.06 PROJECT CONDITIONS

A. Perform balancing on existing systems prior to any system revisions being made.

B. Do not perform testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed, operational testing of control system is complete.

C. Conduct testing and balancing with clean filters in place. Simulate dirty filter loading for electrical equipment room economizer fans.

1.07 SIX-MONTH CALLBACK

A. An addition to the requirements of the contract, within 6 months after completion of test and balance work, the Owner, at its discretion, may request a recheck or resetting of any equipment or device listed in the test reports.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 AIR SYSTEMS

A. General: Measurements shall be in accordance with recognized procedures and practices of the AABC or NEBB. Record on appropriate forms.

B. Preliminary:
   1. Identify and list size, type, and manufacture of all equipment to be tested, including air outlets and inlets.
   2. Use manufacturer's ratings for equipment to make required calculations except where field test shows ratings to be impractical.

C. Execution:
   1. Adjust fan speeds and motor drives for required air volume, within +5 percent maximum. Set speed to provide air volume at farthest run without excess static pressure. Provide additional sheaves and belts as required to accomplish speed adjustment.
      a. Provide VFD setpoints for each of the following operating conditions:
         1) Both ranges in use.
         2) Public range in use and other trunk branch closed.
         3) Law enforcement range in use and other trunk branch closed.
   2. Adjust all automatic dampers, outside air, return air, and exhaust dampers for design conditions.
   3. Read static air pressure conditions on all air handling equipment, including filter and coil pressure drops, and total pressure across the fan. Use a Dwyer Series 400 air velocity meter, or equivalent, for final static pressures at equipment and where critical readings are required.
   4. Measure temperature conditions across all outside air, return air, and exhaust dampers to check leakage.
   5. Read and record motor data and amperage draw.
   6. For variable volume systems, establish minimum static pressure required at sensing point to permit operation over entire VAV range.

D. Distribution:
   1. Read and adjust all air outlets to design air volumes, within 10 percent of design. Advise the Owner's Representative if deficiencies are noted to enable proper corrective actions.
   2. Evaluate all building and room pressure conditions to determine adequate supply and return air conditions.
   3. Evaluate all building and room pressure conditions to determine adequate performance of the system to maintain temperatures without draft.
   4. Perform multipoint pitot traverses to confirm instrumentation, shaft tightness, fan operation, etc. Pitot traverses shall be performed using a Dwyer Series 400 air velocity meter, or equivalent, only with applicable duct probe.
   5. Mark all balancing dampers.

3.02 AUTOMATIC CONTROL SYSTEM

A. In cooperation with control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations.

B. Verify all controls for proper operation and calibration and list controls requiring adjustment by control system installer.

3.03 COORDINATION

A. Coordinate work between balancing agency and other trades to ensure rapid completion of the work.

B. Engage the balancing agency to assist with:
   1. Checkout, startup, calibration of instrumentation, and operational, functional, and final acceptance test plans, procedures, checklists and reports.
   2. Development of systems manuals.
   3. Development of operation and maintenance manuals and training plan.

C. Deficiencies noted during the course of air balancing in the mechanical installation shall be promptly reported to the Architect to allow corrective action to proceed.

D. Provide periodic review of progress as requested.

END OF SECTION **230593**

SECTION 230713 – MECHANICAL INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes insulation for piping, ductwork, and equipment.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230050, Basic Mechanical Materials and Methods

B. Section 230529, Hangers and Supports

1.03 REFERENCES

A. ASHRAE: American Society of Heating, Refrigeration, and Air-Conditioning Engineers

B. ASTM: American Society for Testing and Materials

C. NFPA: National Fire Protection Association

D. UL: Underwriters Laboratories

1.04 SUBMITTALS

A. Product Data: For each type of insulation, including density, conductivity, thickness, jacket, vapor barrier and flame spread and smoke developed indexes.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723 and ASTM E84.
   2. Energy Codes: ASHRAE 90.1-2019 shall govern where requirements for thickness exceeds thickness specified.

B. Protection: Protect against dirt, water, chemical or mechanical damage before, during, and after installation. Repair or replace damaged insulation at no additional cost to the Owner.

C. Source Quality Control:
   1. Service: Use insulation specifically manufactured for service specified.
   2. Labeling: Insulation labeled or stamped with brand name and number.
   3. Insulation and accessories shall not provide any nutritional or bodily use to fungi, bacteria, insects, rats, mice or other vermin, shall not react corrosively with equipment, piping or ductwork and shall be asbestos free.

PART 2 PRODUCTS

2.01 GENERAL

A. Each insulation type shall be of one manufacturer.
   1. Fiberglass insulation manufacturers:
      a. CertainTeed
      b. Knauf Insulation
      c. Johns Manville

d. Owens Corning
e. Or Approved.

2. Elastomeric insulation manufacturers:
   a. Armacell
   b. Aeroflex USA
   c. K-flex
   d. Or Approved.
3. Field applied jacket manufacturers:
   a. Johns Manville
   b. Speedline
   c. ITW
   d. RPR Products
   e. Or Approved.

2.02 PIPE INSULATION

A. Elastomeric: Expanded closed cell, 0.27 per inch maximum K-factor at 75ºF mean temperature and 220ºF maximum service rating with fitting covers. Insulation shall meet ASTM C534 Type II, and NFPA 90A.

2.03 DUCT INSULATION, EXTERNAL

A. Fiberglass: blanket 3-inch thick unless specified or shown otherwise with 0.75 psf nominal density, 0.29 per inch maximum K-factor at 75ºF mean temperature, 250ºF minimum service rating and foil-scrim-kraft jacket. Insulation shall meet ASTM C553, NFPA 90A.

B. Semi-Rigid Fiberglass: 2-inch thick unless specified or shown otherwise with 3.0 pcf density, 0.23 per inch maximum K-factor at 75ºF mean temperature, 150ºF minimum service rating and all purpose vapor barrier facing with white Kraft paper finish. Insulation shall meet ASTM C612, NFPA 90A.

C. Rigid Fiberglass: Same as semi-rigid except with 3.0 pcf density and 0.23 per inch maximum K-factor.

2.04 FIELD APPLIED JACKETS

A. PVC piping jacket: 30-mil thick high impact UV-resistant white PVC. PVC jacketing shall meet ASTM D 1784, Class 16354.

B. Metal pipe jacket: 0.016-inch thick aluminum alloy 3003/3105 with H14 temper, smooth, mill finish jacket with form-fitting covers, stainless steel bands and sealant

2.05 ACCESSORIES

A. Adhesives:
   1. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
   2. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   3. Elastomeric: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Pins, anchors: Welded pins, or metal or nylon anchors with galvanized steel or fiber washer, or clips. Pin diameter shall be as recommended by the insulation manufacturer.

C. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.

D. Staples: Outward clinching galvanized steel.

E. Insulation Protection Saddles: 12-inch long, 16-gauge steel. Comply with ANSI/MSS SP-58 (Type 40).

F. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. 4-inches wide.

G. Bands: 3/4 inch wide, Stainless Steel, ASTM A 666, Type 304; 0.020 inch thick.

H. Wire: 0.062-inch, soft-annealed, stainless steel.

I. Mastic: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates. Comply with MIL-C-19565C, Type II.

PART 3 EXECUTION

3.01 GENERAL

A. Applicators: Applicators shall be employed by a firm that specializes in insulation work.

B. Preparation: Surfaces of piping, equipment, and ductwork shall be clean, free of oil or dirt, and dry before insulation is applied.

C. Stamps: ASME stamps, UL labels, and similar stamps and labels shall not be covered.

D. Any insulation that becomes damaged, water soaked, or stained shall be replaced at no additional cost to the Owner.

3.02 INSULATION APPLIED LOCATIONS

A. General:
   1. All external insulation shall have continuous vapor barriers unless specifically noted otherwise.

B. Insulation shall include all fittings, unions, flanges, mechanical couplings, valve bodies, valve bonnets, and piping through sleeves.

C. Valves and irregular fittings shall be insulated with section of pipe insulation and insulating cement, securely fastened, and finished with 6 oz. canvas and Foster 30-36, or equivalent lagging adhesive.

D. Expansion Joints and Flexible Connectors: Pipe insulation or block of same material and thickness as adjacent piping.

E. Install PVC or metal pipe jacket for insulated piping exposed to weather.

F. Supply Ductwork:
   1. Exposed: Rectangular ductwork insulated with semi-rigid or rigid fiberglass board.
   2. Concealed: Insulated with fiberglass blanket.

G. Refrigerant suction lines: Elastomeric insulation, 1-inch thick. Provide field applied jackets for piping located outdoors.

3.03 PIPING INSTALLATION

A. General:
   1. Joints: Coat both sides of complete joining area with applicable adhesive.
      a. Longitudinal Joints: Make joints on top or back of pipe to minimize visibility. Except for foam plastic, seal with closure system or 3-inch-wide tape.
      b. Butt Joints: Butt tightly together and, except for foam plastic, seal with 3-inch-wide tape or butt straps.
      c. Multiple Layered Insulation: Joints shall be staggered.
   2. Access: Strainer and other items requiring service or maintenance with easily removable and replaceable section of insulation to provide access.
   3. Voids: Fill all voids, chipped corners, and other openings with insulating cement or material compatible with insulating material. In insulation with vapor barrier, coat with vapor barrier mastic.
   4. Seal joints, seams, and fittings of metal watertight jackets at exterior locations.
   5. Install field applied jackets for piping located outdoors in accordance with both the jacket and insulation manufacturer's written installation instructions.

B. Elastomeric Insulation:
   1. Slit full length and snap around pipe.
   2. Make cuts perpendicular to insulating surface leaving no cut section exposed.
   3. Do not stretch insulation to cover joints or fittings.
   4. Seal joints with adhesive. Sealing joints with tape will not be allowed.
   5. Refrigeration suction lines shall have a continuous vapor barrier, which shall not be pierced or broken.
   6. Insulation shall be continuous through pipe hanger, with shield at each hanger.
   7. Vapor barrier and insulation shall be protected with pipe shield specified in Section 230529, Hangers and Supports for HVAC Piping and Equipment.

C. Fittings: The continuous vapor barrier for refrigeration suction lines shall not be pierced or broken. Fittings covered with covers made up of mitered sections of insulation or with formed pipe fitting covers.

D. Unions, Flanges, Mechanical Joints, Valves, Etc:
   1. General:
      a. As specified for fittings.
      b. Minimum thickness same as specified for piping.
   2. Unions: Build up insulation at least 1/2 inch beyond adjoining insulation.
   3. Flanges: Insulation with square corners.
   4. Flanged Valves: Insulation with square corners.

E. Vapor Barrier Insulation:
   1. Insulation for pipe requiring vapor barrier protection 1 1/4-inch or smaller, insulation continuous through pipe hanger, with shield at each hanger.
   2. For all piping, vapor barrier shall be protected with pipe shield specified in Section 220529, Hangers and Supports.

3.04 DUCTWORK INSTALLATION

A. General:
   1. Install in accordance with the manufacturer's instructions.
   2. The vapor barrier shall be continuous. Tears, holes, staples, etc. shall be coated with vapor barrier mastic and patched with facing or tape. Joints between insulation and access shall be provided with vapor barrier mastic.
   3. Insulation at access panels shall be removable or attached to panel with edges of panel and opening reinforced with metal beading.

B. External Blanket Insulation:
   1. Secure insulation to ductwork with 20-gauge snap wires 24 inches on center and at all joints.
   2. Lap joints and seams a minimum of 3 inches and sealed with jacket tape.

C. Board Insulation:
   1. Space rectangular ducts with weld pins a maximum of 18 inches on center in both directions.
   2. All corners shall be made with joints; bending insulation around corners will not be allowed.
   3. All joints and seams shall be butted tight together.
   4. Butt joints with 3-inch-wide tape.
   5. Finish corners with 3-inch-wide tape.

D. Volume Dampers: Where volume dampers do not allow for continuous insulation, terminate insulation clear of handle sweep and finish edges to maintain vapor barrier and to prevent damage to the insulation.

E. Exterior installations: Cover insulation with minimum 28-gage sheetmetal wrap, sealed weathertight, and painted per Sections 230100 and 233113.

3.05 FIELD QUALITY CONTROL

A. Field Test: All systems shall be tested and approved prior to installation of insulation.

B. Existing Insulation:
   1. Repair existing insulation damaged during construction.
   2. Make neat connections where new and existing insulation meet.
   3. Where existing piping, ductwork, or equipment is removed, cover existing surfaces neatly to match existing.

END OF SECTION **230713**

SECTION 230900 – INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. DDC system for monitoring and controlling of Firing Range HVAC systems (EF-1, MAU-1, and ACCU-1).

B. Related Requirements:
   1. Section 230553 “Mechanical Identification”
   2. Section 230593 “Testing, Adjusting, and Balancing”
   3. Section 230993 "Sequence of Operations" for control sequences in DDC systems.

1.03 DEFINITIONS

A. Algorithm: A logical procedure for solving a recurrent mathematical problem. A prescribed set of well-defined rules or processes for solving a problem in a finite number of steps.

B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.

C. BACnet Specific Definitions:
   1. BACnet: Building Automation Control Network Protocol, ASHRAE 135. A communications protocol allowing devices to communicate data and services over a network.
   2. BACnet Interoperability Building Blocks (BIBBs): BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBs are combined to build the BACnet functional requirements for a device.
   3. BACnet/IP: Defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number.
   4. BACnet Testing Laboratories (BTL): Organization responsible for testing products for compliance with ASHRAE 135, operated under direction of BACnet International.
   5. PICS (Protocol Implementation Conformance Statement): Written document that identifies the particular options specified by BACnet that are implemented in a device.

D. Binary: Two-state signal where a high signal level represents ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.

E. Controller: Generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control. Three types of controllers are indicated: Network Controller, Programmable Application Controller, and Application-Specific Controller.

F. Control System Integrator: An entity that assists in expansion of existing enterprise system and support of additional operator interfaces to I/O being added to existing enterprise system.

G. COV: Changes of value.

H. DDC System Provider: Authorized representative of, and trained by, DDC system manufacturer and responsible for execution of DDC system Work indicated.

I. Distributed Control: Processing of system data is decentralized and control decisions are made at subsystem level. System operational programs and information are provided to remote subsystems and status is reported back. On loss of communication, subsystems shall be capable of operating in a standalone mode using the last best available data.

J. DOCSIS: Data-Over Cable Service Interface Specifications.

K. Gateway: Bidirectional protocol translator that connects control systems that use different communication protocols.

L. HLC: Heavy load conditions.

M. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.

N. I/P: Current to pneumatic.

O. LAN: Local area network.

P. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

Q. Modbus TCP/IP: An open protocol for exchange of process data.

R. MS/TP: Master-slave/token-passing, IEE 8802-3. Datalink protocol LAN option that uses twisted-pair wire for low-speed communication.

S. MTBF: Mean time between failures.

T. Network Controller: Digital controller, which supports a family of programmable application controllers and application-specific controllers that communicate on peer-to-peer network for transmission of global data.

U. Network Repeater: Device that receives data packet from one network and rebroadcasts it to another network. No routing information is added to protocol.

V. PDA: Personal digital assistant device, or similar application loaded on a smart phone.

W. Peer to Peer: Networking architecture that treats all network stations as equal partners.

X. POT: Portable operator's terminal.

Y. PUE: Performance usage effectiveness.

Z. RAM: Random access memory.

AA. RF: Radio frequency.

BB. Router: Device connecting two or more networks at network layer.

CC. Server: Computer used to maintain system configuration, historical and programming database.

DD. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

EE. UPS: Uninterruptible power supply.

FF. USB: Universal Serial Bus.

GG. User Datagram Protocol (UDP): This protocol assumes that the IP is used as the underlying protocol.

HH. VAV: Variable air volume.

II. WLED: White light emitting diode.

1.04 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product include the following:
   1. Material descriptions, dimensions of individual components and profiles, and finishes.
   2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
   3. Product description with complete technical data, performance curves, and product specification sheets.
   4. Installation, operation and maintenance instructions including factors effecting performance.
   5. Bill of materials indicating quantity, manufacturer, and extended model number for each unique product.
      a. Gateways.
      b. Routers.
      c. DDC controllers.
      d. Enclosures.
      e. Electrical power devices.
      f. UPS units.
      g. Accessories.
      h. Instruments.
   6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
   7. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

B. Shop Drawings:
   1. General Requirements:
      a. Include cover drawing with Project name, location, Owner, Architect, Contractor and issue date with each Shop Drawings submission.
      b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.
      c. Prepare Drawings using AutoCAD.

2. Include plans, elevations, sections, and mounting details where applicable.
3. Plan Drawings indicating the following:
   a. Room names and numbers with coordinated placement to avoid interference with control products indicated.
4. Schematic drawings for each controlled HVAC system indicating the following:
   a. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
   b. A graphic showing location of control I/O in proper relationship to HVAC system.
   c. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
   d. Unique identification of each I/O that shall be consistently used between different drawings showing same point.
   e. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to DDC controllers.
   f. Narrative sequence of operation.
   g. Graphic sequence of operation, showing all inputs and output logical blocks.
5. Control panel drawings indicating the following:
   a. Interior subpanel layout, drawn to scale and showing all internal components, cabling and wiring raceways, nameplates and allocated spare space.
   b. Front, rear, and side elevations and nameplate legend.
   c. Unique drawing for each panel.
6. DDC system network riser diagram indicating the following:
   a. Each device connected to network with unique identification for each.
   b. Interconnection of each different network in DDC system.
   c. For each network, indicate communication protocol, speed and physical means of interconnecting network.
7. Monitoring and control signal diagrams indicating the following:
   a. Control signal cable and wiring between controllers and I/O.
   b. Point-to-point schematic wiring diagrams for each product.
8. Color graphics indicating the following:
   a. Itemized list of color graphic displays to be provided.
   b. For each display screen to be provided, a true color copy showing layout of pictures, graphics and data displayed.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For DDC system to include in operation and maintenance manuals.
   1. Project Record Drawings of as-built versions of submittal Shop Drawings in accordance with Division 01 requirements.
   2. Testing and commissioning reports and checklists of completed final versions of reports, checklists, and trend logs.
   3. As-built versions of submittal Product Data.
   4. Names, addresses, e-mail addresses and 24-hour telephone numbers of Installer and service representatives for DDC system and products.
   5. Operator's manual with procedures for operating control systems including logging on and off, handling alarms, producing point reports, trending data, overriding computer control and changing set points and variables.

6. Backup copy of graphic files, programs, and database on electronic media such as DVDs.
7. List of designated spare parts with part numbers.
8. Licenses, guarantees, and warranty documents.
9. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
10. Copy of training material used at specified Owner training

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials and parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.08 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace products that fail in materials or workmanship within specified warranty period.
   1. Failures shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Trane Tracer SC+
   2. Carrier I-VU
   3. Delta Controls
   4. Alerton Inc. – As provided by Environmental Controls.
   5. Automated Logic Corporation – As provided by Clima-Tech Corp.
   6. MetaSys – As provided by Johnson Controls, Inc.
   7. Reliable Controls – As provided by Sunbelt Controls, Inc.
   8. Or Approved.

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

2.02 DDC SYSTEM DESCRIPTION

A. Microprocessor-based BACnet monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.
   1. BACnet DDC system shall consist of a high-speed, peer-to-peer network of distributed DDC controllers, other network devices, operator interfaces, and software.

B. 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.

C. Provide products necessary to complete the sequences of operations identified in Section 230993 “Sequence of Operations”.

2.03 WEB ACCESS

A. DDC system shall be Web based, with Web-Based user access.
   1. DDC system software shall be based on server thin-client architecture, designed around open standards of Web technology. DDC system server shall be accessed using a Web browser over DDC system network, using Owner's LAN, and remotely over Internet through Owner's LAN.
   2. Intent of thin-client architecture is to provide operators complete access to DDC system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, and trends; to configure trends, points, and controllers; and to edit programming.
   3. Web access shall be password protected.

2.04 OPERATOR'S INTERFACE

A. Displays
   1. Operator's workstation shall display all data associated with project as called out on drawings and/or object type list supplied. Graphic files shall be created using digital, full color photographs of system installation, AutoCAD or Visio drawing files of field installation drawings and wiring diagrams from as-built drawings. Operator's workstation shall display all data using three-dimensional graphic representations of all mechanical equipment. System shall be capable of displaying graphic file, text, and dynamic object data together on each display and shall include animation. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user. Workstation shall allow user to change all field-resident EMCS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc., from any screen, no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.
   2. All displays and programming shall be generated and customized by the local EMCS supplier and installer. Systems requiring factory development of graphics or programming of DDC logic are specifically prohibited.
   3. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual graphic items on the display screen as an overlay to the system graphic. Each analog input object may be assigned a minimum of five graphic files, each with high/low limits for automatic selection and display of these graphics. As an example, a graphic representation of a thermometer would rise and fall in response to either the room temperature or its deviation from the controlling setpoint. Analog output objects, when selected with the mouse, shall be displayed as a prompted dialog (text only) box. Selection for display type shall be individual for each object. Analog object values may be changed by selecting either the "increase" or "decrease" arrow in the analog object spinner box without using the keypad. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trend logs.
   4. Analog objects may also be assigned to a system graphic, where the color of the defined object changes based on the analog object's value. For example, graphical thermostat device served by a single control zone would change color with respect to the temperature of the zone or its deviation from setpoint. All editing and area assignment shall be created or modified online using simple icon tools.

5. Binary objects shall be displayed as ACTIVE/INACTIVE/NULL or with customized text such as Hand-Off-Auto. Text shall be justified left, right or center as selected by the user. Also, allow binary objects to be displayed as individual change-of-state graphic objects on the display screen such that they overlay the system graphic. Each binary object displayed in this manner shall be assigned up to three graphic files for display when the point is ON, OFF or in alarm. For binary outputs, toggle the object's commanded status when the graphic item is selected with the system mouse. Similarly, allow the workstation operator to toggle the binary object's status by selecting with the mouse, for example, a graphic of a switch or light, which then displays a different graphic (such as an "ON" switch or lighted lamp. Additionally, allow binary objects to be displayed as an animated graphic. Animated graphic objects shall be displayed as a sequence of multiple graphics to simulate motion. For example, when a pump is in the OFF condition, display a stationary graphic of the pump. When the operator selects the pump graphic with the mouse, the represented object's status is toggled and the graphic of the pump's impeller rotates in a time-based animation. The operator shall be able to click an animated graphical object or switch it from the OFF position to ON, or ON to OFF. Allow operator to change graphic file assignment and also create new and original graphics online. System shall be supplied with a library of standard graphics, which may be used unaltered or modified by the operator. Systems that do not allow customization or creation of new graphic objects by the operator (or with third-party software) shall not be allowed.
6. A customized menu label (push-button) shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu label pushbuttons may be mixed on the same display to allow sub-displays to exist for each item. Each display may be protected from viewing unless operator has appropriate security level. A security level may be assigned to each display and system object. The menu label shall not appear on the graphic if the operator does not have the appropriate security level.
7. The BAS displays shall have the ability to link to content outside of the BAS system. Such content shall include but is not limited to: Launching external files in their native applications (for example, a Microsoft Word document) and launching a Web browser resolving to a specified Web address.
8. The BAS system shall have the ability to run multiple, concurrent displays windows showing continuously updated data.

B. Password Protection
1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's assigned functions when user is logged on. This includes displays as outlined above.
2. System shall include an Auto Logout Feature that shall automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period shall be adjustable by system administrator. Auto Logout may be enabled and disabled by system administrator. Operator terminal shall display message on screen that user is logged out after Auto Logout occurs.
3. The system shall permit the assignment of an effective date range, as well as an effective time of day, that the User IDs are permitted to authenticate.

4. Each operator's terminal shall provide security for a minimum of 200 users. Each user shall have an individual User ID, User Name, and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID shall be 0–8 characters, User Name shall be 0–29 characters, and Password shall be 8–30 characters long. Each system user shall be allowed individual assignment of only those control functions, menu items, and user specific system start display, as well restricted access to discrete BACnet devices to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator's terminal. Users should have the capability to be assigned to specific user type "groups" that can share the same access levels to speed setup. Users who are members of multiple "groups" shall have the ability to activate/deactivate membership to those groups while using the BAS (without logout). Users shall also have a set security level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct security levels for assignment to users.

C. Operator Activity Log
   1. Operator Activity Log that tracks all operator changes and activities shall be included with system. System shall track what is changed in the system, who performed this change, date and time of system activity, and value of the change before and after operator activity. Operator shall be able to display all activity, sort the changes by user and also by operation. Operator shall be able to print the Operator Activity log display.
   2. Log shall be gathered and archived to hard drive on operator's workstation as needed. Operator shall be able to export data for display and sorting in a spreadsheet.
   3. Any displayed data that is changeable by the operator may be selected using the right mouse button and the operator activity log shall then be selectable on the screen. Selection of the operator activity log using this method shall show all operator changes of just that displayed data.

D. Scheduling
   1. Operator's workstation shall show all information in easy-to-read daily format including calendar of this month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority. Priority for scheduling shall be events, holidays and daily, with events being the highest.
   2. Holiday and special event schedules shall display data in calendar format. Operator shall be able to schedule holidays and special events directly from these calendars.
   3. Operator shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate security access.
   4. System shall include a Schedule Wizard for set up of schedules. Wizard shall walk user through all steps necessary for schedule generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.
   5. Scheduling shall include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and history of previous starts. Each and every individual zone shall have optimum start time independently calculated based on all parameters listed. User shall input schedules to set time that occupied setpoint is to be attained. Optimum start feature shall calculate the startup time needed to match zone temperature to setpoint. User shall be able to set a limit for the maximum startup time allowed.

6. Any displayed data that is changeable by the operator may be selected using the right mouse button and the schedule shall then be selectable on the screen. Selection of the schedule using this method shall allow the viewing of the assigned schedule or launch the Schedule Wizard to allow the point to be scheduled.

E. Alarm Indication and Handling.
1. Operator's workstation shall provide audible, visual, printed, and email means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s) currently running. Printout of alarms shall be sent to the assigned terminal and port. Alarm notification can be filtered based on the User ID's authorization level.
2. System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator's terminal. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment, and identification of operator acknowledging alarm.
3. Alarm messages shall be in user-definable text (English or other specified language) and shall be delivered either to the operator's terminal, client or through remote communication using email (Authenticated SMTP supported).
4. System shall include an Alarm Wizard for set up of alarms. Wizard shall walk user through all steps necessary for alarm generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting alarm setup.
5. Any displayed data that is changeable by the operator may be selected using the right mouse button and the alarm shall then be selectable on the screen. Selection of the alarm using this method shall allow the viewing of the alarm history or launch the Alarm Wizard to allow the creation of a new alarm.

F. Trend Log Information
1. System server shall periodically gather historically recorded data stored in the building controllers and store the information in the system database. Stored records shall be appended with new sample data, allowing records to be accumulated. Systems that write over stored records shall not be allowed unless limited file size is specified. System database shall be capable of storing up to 50 million records before needing to archive data. Samples may be viewed at the operator's workstation. Operator shall be able to view all trended records, both stored and archived. All trend log records shall be displayed in standard engineering units.
2. Software that is capable of graphing the trend logged object data shall be included. Software shall be capable of creating two-axis (X, Y) graphs that display up to 10 object types at the same time in different colors. Graphs shall show object values relative to time. Each trend log shall support a custom scale setting for the graph view that is to be stored continuously. System shall be capable of trending on an interval determined by a polling rate, or change-of-value.
3. Operator shall be able to change Trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations shall be password protected. Setup and viewing may be accessed directly from any and all graphics on which object is displayed.

4. System shall include a Trend Wizard for setup of logs. Wizard shall walk user through all necessary steps. Wizard shall have its own pull-down selection for startup, or may be started by right-clicking on value displayed on graphic, and then selecting Trend logs from the displayed menu.
5. System shall be capable of using Microsoft SQL as the system database.
6. Any displayed data that is changeable by the operator may be selected using the right mouse button and the trend log shall then be selectable on the screen. Selection of the trend log using this method shall allow the viewing of the trend log view or launch the Trend log wizard to allow the creation of a new trend.

G. Energy Log Information
1. System server shall be capable of periodically gathering energy log data stored in the field equipment and archive the information. Archive files shall be appended with new data, allowing data to be accumulated. Systems that write over archived data shall not be allowed unless limited file size is specified. Display all energy log information in standard engineering units.
2. All data shall be stored in database file format for direct use by third-party programs. Operation of system shall stay completely online during all graphing operations.
3. Operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. System shall support using flow and temperature sensors for BTU monitoring.
4. System shall display archived data in tabular format form for both consumption and peak values. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format, the user shall be able to select a specific period of data to view.

H. Reports
1. System server shall be capable of periodically producing reports of trend logs, alarm history, tenant activities, device summary, energy logs, and override points. The frequency, content, and delivery are to be user adjustable.
2. All reports shall be capable of being delivered in multiple formats including text- and comma-separated value (CSV) files. The files can be printed, emailed, or saved to a folder, either on the server hard drive or on any network drive location.

I. Configuration/Setup
1. Provide means for operator to display and change system configuration. This shall include, but not be limited to, system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc. Items shall be modified using understandable terminology with simple mouse/cursor key movements.

J. Field Engineering Tools
1. Operator’s workstation software shall include field engineering tools for programming all controllers supplied. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from other types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.

2. User shall be able to select a graphical function block from menu and place on screen. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.
3. Programming tools shall include a real-time operation mode. Function blocks shall display real-time data and be animated to show status of data inputs and outputs when in real-time operation. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.
4. Field engineering tools shall also include a database manager of applications that include logic files for controllers and associated graphics. Operator shall be able to select unit type, input/output configuration and other items that define unit to be controlled. Supply minimum of 250 applications as part of workstation software.
5. Field engineering tool shall include Device Manager for detection of devices connected anywhere on the BACnet network by scanning of the entire network. This function shall display device instance, network identification, model number, and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computer's hard drive. If needed, this file shall be downloaded to the appropriate controller using the mouse.
6. System shall automatically notify the user when a device that is not in the database is added to the network.
7. System shall include backup/restore function that will back up entire system to selected medium and then restore system from that media. The system shall be capable of creating a backup for the purpose of instantiating a new client PC.
8. The system shall provide a means to scan, detect, interrogate, and edit third-party BACnet devices and BACnet objects within those devices.

K. At the conclusion of project, contractor shall leave with Owner a digital data storage device complying with the Owner's IT requirements that includes the complete software operation system and project graphics, setpoints, system parameters, etc. This backup shall allow the Owner how to completely restore the system in the case of a server malfunction.

2.05 BUILDING CONTROLLER

A. General Requirements
   1. BACnet Conformance
      a. Building Controller shall be approved by the BTL as meeting the BACnet Building Controller requirements.
      b. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
   2. Building controller shall be of modular construction such that various modules may be selected to fit the specific requirements of a given project. At a minimum, modules shall consist of a power supply module, a BACnet Ethernet-MS/TP (master slave token passing) module, a BACnet MS/TP-only module, and a modem module for telephone communication. Those projects that require special interfaces may use Modbus modules as needed. However, all Ethernet communications and all controllers—including central plant controllers, advanced application controllers and unitary controllers—supplied by BAS manufacturer shall utilize the BACnet protocol standard.

3. Modules shall be selected to fit the particular project application. Up to seven modules shall be powered by a single power supply module. All modules shall be panel-mounted on DIN rail for ease of addition and shall be interconnected using a simple plug-in cable. A module in the middle shall be replaceable without removing any other modules.
4. All modules shall be capable of providing global control strategies for the system based on information from any objects in the system, regardless if the object is directly monitored by the building controller module or by another controller. The software program implementing these strategies shall be completely flexible and user-definable. All software tools necessary for programming shall be provided as part of project software. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site, using a WAN or downloaded through remote communications are not acceptable. Changing global strategies using firmware changes is also unacceptable.
5. Programming shall be object-oriented using control function blocks, and support DDC functions, 1000 Analog Values and 1000 Binary Values. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be supplied and be resident on workstation. The same tool shall be used for all controllers.
6. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed using the operator's workstation or field computer.
7. Controller shall have sufficient memory to ensure high performance and data reliability. Battery shall provide power for orderly shutdown of controller and storage of data in nonvolatile flash memory. Battery backup shall maintain real-time clock functions for a minimum of 20 days.
8. Global control algorithms and automated control functions shall execute using 32-bit processor.
9. Schedules
    a. Each building controller module shall support a minimum of 80 BACnet Schedule Objects and 80 BACnet Calendar Objects.
    b. Building controller modules shall provide normal seven-day scheduling, holiday scheduling and event scheduling.
10. Logging Capabilities
    a. Each building controller shall log as minimum 320 values. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
    b. Logs may be viewed both on-site or off-site using WAN or remote communication.
    c. Building controller shall periodically upload trended data to networked operator's workstation for long-term archiving if desired.
    d. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.
11. Alarm Generation
    a. Alarms may be generated within the system for any object change of value or state (either real or calculated). This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
    b. Each alarm may be dialed out as noted elsewhere.
    c. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.

d. Controller must be able to handle up to 320 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

B. Ethernet – MS/TP Module
1. Ethernet – MS/TP Module shall support every function as listed under paragraph A, General Requirements, of this section and the following.
2. All communication with operator's workstation and all application controllers shall be through BACnet. Building controller Ethernet – MS/TP module shall incorporate as a minimum, the functions of a 2-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet 10/100MHz) and MS/TP LAN. Ethernet – MS/TP module shall also route messages from all other building controller modules onto the BACnet Ethernet network.
   a. MS/TP LAN must be software-configurable from 9.6 to 76.8Kbps.
   b. The RJ-45 Ethernet connection must accept either 10Base-T or 100Base-TX BACnet over twisted pair cable (UTP).
3. BACnet Conformance
   a. Ethernet – MS/TP module shall, as a minimum, support MS/TP and Ethernet BACnet LAN types. It shall communicate directly using these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be approved by the BACnet Testing Laboratory (BTL) as meeting the BACnet Building Controller requirements.
   b. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
   c. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on WANs and CANs and function as a BACnet Broadcast Management Device (BBMD).

C. MS/TP Module
1. MS/TP Module shall support every function as listed under paragraph A, General Requirements, of this section and the following.
2. Building controller MS/TP module communications shall be though BACnet MS/TP LAN to all advanced application and application-specific controllers. MS/TP module shall also route messages to Ethernet - MS/TP module for communication over WAN.
   a. MS/TP LAN must be software configurable from 9.6 to 76.8Kbps
   b. Configuration shall be through RS-232 connection.
3. BACnet Conformance
   a. MS/TP module shall be approved by the BTL (BACnet Testing Laboratory) as meeting the BACnet Building Controller requirements. MS/TP module shall as a minimum support MS/TP BACnet LAN type. It shall communicate directly using this BACnet LAN as a native BACnet device and shall support simultaneous routing functions between all supported LAN types.
   b. Standard BACnet object types supported shall include, as a minimum, Analog Value, Binary Value, Calendar, Device, File, Group, Notification Class, Program, and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

D. Power Supply Module
   1. Power supply module shall power up to seven building controller modules. Input for power shall accept between 17¬–30VAC, 47–65Hz.
   2. Power supply module shall include rechargeable battery for orderly shutdown of controller modules including storage of all data in flash memory and for continuous operation of real-time clocks for minimum of 20 days.

2.06 AUXILIARY CONTROL DEVICES

A. Temperature Sensors
   1. All temperature sensors to be solid-state electronic, interchangeable with housing appropriate for application. Wall sensors to be installed as indicated on drawings, with digital display for continuous indication of space temperature. Mount 48 inches above finished floor. Duct sensors to be installed such that the sensing element is in the main air stream. Immersion sensors to be installed in wells provided by control contractor, but installed by mechanical contractor. Immersion wells shall be filled with thermal compound before installation of immersion sensors. Outside air sensors shall be installed away from exhaust or relief vents, not in an outside air intake, and in a location that is in the shade most of the day.

B. Air Differential Pressure Switch: Required for filter status. Setpoint shall be adjustable with operating range of 0.05 to 5 inches W.G. Contactor shall close when set pressure differential is met or exceeded.

C. Differential Pressure Transmitters
   1. Pressure transmitters shall be of two-wire, 4-20 mA output type with a capacitance element having an accuracy of +/- 1% over the entire range. Transmitter shall include protection against reverse polarity and supply voltage transients. An accuracy and zero span adjustment shall be provided with each transmitter to allow for recalibration as necessary.
      a. Minimum operating range of +/- 2-inches W.G.

2.07 ELECTRONIC ACTUATORS AND VALVES

A. Quality Assurance for Actuators and Valves
   1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.
   2. NEMA 2 rated enclosures for inside mounting, provide with weather shield for outside mounting.
   3. Five-year manufacturer’s warranty. Two-year unconditional and three-year product defect from date of installation.

B. Execution Details for Actuators and Valves
   1. Furnish a Freeze-stat and install “Hard Wire” interlock to disconnect the mechanical spring return actuator power circuit for fail-safe operation. Use of the control signal to drive the actuators closed is not acceptable.
   2. Each DDC analog output point shall have an actuator feedback signal, independent of control signal, wired and terminated in the control panel for true position information and troubleshooting. Or the actuator feedback signal may be wired to the DDC as an analog input for true actuator position status.
   3. Primary valve control shall be analog (2–10VDC, 4–20mA).

C. Actuators for damper and control valves 0.5–6 inches shall be electric unless otherwise specified, provide actuators as follows:
   1. UL Listed Standard 873 and Canadian Standards association Class 481302 shall certify actuators.
   2. NEMA 2 rated actuator enclosures for inside mounting. Use minimum NEMA 3R rated actuator enclosures for exposure to outdoors.
   3. Five-year manufacturer's warranty. Two-year unconditional and Three-year product defect from date of installation.
   4. Mechanical spring shall be provided when specified. Capacitors or other non-mechanical forms of fail-safe are not acceptable.
   5. Position indicator device shall be installed and made visible to the exposed side of the actuator. For damper short shaft mounting, a separate indicator shall be provided to the exposed side of the actuator.
   6. Overload Protection: Actuators shall provide protection against actuator burnout by using an internal current limiting circuit or digital motor rotation sensing circuit. Circuit shall insure that actuators cannot burn out due to stalled damper or mechanical and electrical paralleling. End switches to deactivate the actuator at the end of rotation are acceptable only for butterfly valve actuators.
   7. A Pushbutton gearbox release shall be provided for all non-spring actuators.
   8. Modulating actuators shall be 24VAC and consume 10VA power or less.
   9. Conduit connectors are required when specified and when code requires it.

D. Damper Actuators:
   1. Outside air and exhaust air damper actuators shall be mechanical spring return. Capacitors or other non-mechanical forms of fail-safe are not acceptable. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the damper as required.
   2. Electric damper actuators shall be direct shaft-mounted and use a V-bolt and toothed V-clamp causing a cold weld effect for positive gripping. Single bolt or set-screw type fasteners are not acceptable.
   3. One electronic actuator shall be direct shaft-mounted per damper section. No connecting rods or jackshafts shall be needed.
   4. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft-mounted per damper section. (See below execution section for more installation details.)

E. Performance Verification Test
   1. Control loops shall cause productive actuation with each movement of the actuator and actuators shall modulate at a rate that is stable and responsive. Actuator movement shall not occur before the effects of previous movement have affected the sensor.
   2. Actuator shall have capability of signaling a trouble alarm when the actuator Stop-Go Ratio exceeds 30%.

F. Actuator mounting for damper and valve arrangements shall comply to the following:
   1. Damper or valve actuator ambient temperature shall not exceed 122 degrees F through any combination of medium temperature or surrounding air. Appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation shall be provided as necessary.

2. Actuator cords or conduit shall incorporate a drip leg if condensation is possible. Water shall not be allowed to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point shall be avoided to prevent water from condensing in conduit and running into actuator.

2.08 ENCLOSURES

A. All controllers, power supplies and relays shall be mounted in enclosures.

B. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment. Outdoor enclosures shall be either NEMA 3R, NEMA 4, or NEMA 4X.

C. Enclosures shall have hinged, locking doors.

2.09 IDENTIFICATION

A. Comply with Section 230553 “Mechanical Identification”.

B. Raceway and Boxes:
1. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
2. Paint cover plates on junction boxes and conduit same color as the tape banding for conduits. After painting, label cover plate "HVAC Controls," using an engraved phenolic tag.

C. Equipment Warning Labels:
1. Acrylic label with pressure-sensitive adhesive back and peel-off protective jacket.
2. Lettering size shall be at least 14-point type with white lettering on red background.
3. Warning label shall read "CAUTION-Equipment operated under remote automatic control and may start or stop at any time without warning. Switch electric power disconnecting means to OFF position before servicing."
4. Lettering shall be enclosed in a white line border. Edge of label shall extend at least 0.25 inch beyond white border.

2.10 CONTROL VOLTAGE ELECTRICAL POWER CABLES

A. UTP cable
1. Description: 100-ohm, four-pair UTP.
a. Comply with ICEA S-90-661 for mechanical properties of Category 5e cables.
b. Comply with ICEA S-102-700 for mechanical properties of Category 6 cables.
c. Comply with TIA-568-C.1 for performance specifications.
d. Comply with TIA-568-C.2, Category 5e.
e. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
1) Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
2) Communications, General Purpose: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit.

B. Low-voltage control cable
   1. Paired Cable: NFPA 70, Type CMG.
      a. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
      b. PVC insulation.
      c. Shielded. Lapped or taped shields with drain wires.
      d. PVC jacket.
   2. All instrumentation signals shall have a shielded cable type. Total coverage lapped or taped shields with drain wires shall be used

C. Control-circuit conductors
   1. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
   2. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
   3. Class 3 Remote-Control and Signal Circuits: Stranded copper, power-limited cable, concealed in building finishes above accessible ceiling space.
   4. All control wiring shall be a minimum of 16 AWG THHN stranded for I/O discrete, 120VAC, and 20 gauge stranded for I/O analog.
   5. Runs of 500 feet or more will require a minimum of 14 AWG THHN stranded
   6. No solid copper is to be used

2.11 SOURCE QUALITY CONTROL

A. Evaluate the following according to industry standards for each product and to verify DDC system reliability specified in performance requirements:
   1. DDC controllers.
   2. Gateways.
   3. Routers.

B. Product(s) and material(s) will be considered defective if it does/they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation.
   1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
   2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

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.

3.02 DDC SYSTEM INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

A. Communication Interface to Equipment with Integral Controls:
   1. DDC system shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control.

3.03 ROUTER INSTALLATION

A. Install routers if required for DDC system communication interface requirements indicated.
   1. Install router(s) required to suit indicated requirements.
   2. Vendor remote network access shall only occur via the Owner's managed SSL VPN and RSA tokens.
   3. All networked devices will have anti-malware protection, unless the Owner's Representative deems the system to be a system not commonly affected by malware.

B. Test router to verify that communication interface functions properly.

3.04 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply and to UPS units where indicated.

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

E. Installation of Network Controllers:
   1. Quantity and location of network controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
   2. Install controllers in a protected location that is easily accessible by operators.
   3. Top of controller shall be within 72 inches of finished floor.

F. Application-Specific Controllers:
   1. Quantity and location of application-specific controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
   2. For controllers not mounted directly on equipment being controlled, install controllers in a protected location that is easily accessible by operators.

3.05 INSTALLATION OF WIRELESS ROUTERS FOR OPERATOR INTERFACE

A. Install wireless routers to achieve optimum performance and best possible coverage.

B. Mount wireless routers in a protected location that is within 60 inches of floor and easily accessible by operators.

C. Connect wireless routers to field power supply and to UPS units if network controllers are powered through UPS units.

D. Install wireless router with latest version of applicable software and configure wireless router with WPA2 security and password protection. Create access password with not less than 12 characters consisting of letters and numbers and at least one special character. Document password in operations and maintenance manuals for reference by operators.

E. Test and adjust wireless routers for proper operation with portable workstation and other wireless devices intended for use by operators.

3.06 ENCLOSURES INSTALLATION

A. Install the following items in enclosures, to comply with indicated requirements:
   1. Gateways.
   2. Routers.
   3. Controllers.
   4. Electrical power devices.
   5. UPS units.
   6. Relays.
   7. Accessories.
   8. Instruments.
   9. Actuators

B. Attach wall-mounted enclosures to wall using the following types of steel struts:
   1. For NEMA 250, Type 1 Enclosures (Located indoors): Use painted steel strut and hardware.
   2. Install plastic caps on exposed cut edges of strut.

C. Align top of adjacent enclosures of like size.

D. Install continuous and fully accessible wire ways to connect conduit, wire, and cable to multiple adjacent enclosures. Wire way used for application shall have protection equal to NEMA 250 rating of connected enclosures.

3.07 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identification products and installation.

B. Comply with requirements in Section 230553 “Mechanical Identification” for identification products and installation.

C. Warning Labels:
   1. Shall be permanently attached to equipment that can be automatically started by DDC control system.
   2. Shall be located in highly visible location near power service entry points.

3.08 CONTROL WIRE, CABLE AND RACEWAYS INSTALLATION

A. Comply with NECA 1.

B. Comply with TIA 568-C.1.

C. Wiring Method: Install conductors and cables in raceways and cable trays. Conceal raceway and cables except in unfinished spaces.
   1. Install plenum cable in environmental air spaces, including plenum ceilings.
   2. Comply with requirements of Division 26.
   3. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Field Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Conduit Installation:
   1. Install conduit expansion joints where conduit runs exceed 200 feet, and conduit crosses building expansion joints.
   2. Coordinate conduit routing with other trades to avoid conflicts with ducts, pipes and equipment and service clearance.
   3. Maintain at least 3-inch separation where conduits run axially above or below ducts and pipes.
   4. Limit above-grade conduit runs to 100 feet without pull or junction box.
   5. Do not install raceways or electrical items on any "explosion-relief" walls, or rotating equipment.
   6. Do not fasten conduits onto the bottom side of a metal deck roof.
   7. Flexible conduit is permitted only where flexibility and vibration control is required.
   8. Limit flexible conduit to 3 feet long.
   9. Conduit shall be continuous from outlet to outlet, from outlet to enclosures, pull and junction boxes, and shall be secured to boxes in such manner that each system shall be electrically continuous throughout.
   10. Direct bury conduits underground or install in concrete-encased duct bank where indicated.
      a. Use rigid, nonmetallic, Schedule 80 PVC.
      b. Provide a burial depth according to NFPA 70, but not less than 24 inches.
   11. Secure threaded conduit entering an instrument enclosure, cabinet, box, and trough, with a locknut on outside and inside, such that conduit system is electrically continuous throughout. Provide a metal bushing on inside with insulated throats. Locknuts shall be the type designed to bite into the metal or, on inside of enclosure, shall have a grounding wedge lug under locknut.
   12. Conduit box-type connectors for conduit entering enclosures shall have an insulated throat.
   13. Connect conduit entering enclosures in wet locations with box-type connectors or with watertight sealing locknuts or other fittings.
   14. Offset conduits where entering surface-mounted equipment.
   15. Seal conduit runs used by sealing fittings to prevent the circulation of air for the following:
      a. Conduit extending from interior to exterior of building.
      b. Conduit extending into pressurized duct and equipment.
      c. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.

F. Wire and Cable Installation:
   1. Cables serving a common system may be grouped in a common raceway. Install control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
   2. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.
      a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.
   3. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
   4. 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, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
   5. UTP Cable Installation:
      a. Comply with TIA 568-C.2.
      b. Do not untwist UTP cables more than 1/2 inch from the point of termination, to maintain cable geometry.
   6. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.
   7. Provide strain relief.
   8. Terminate wiring in a junction box.
      a. Clamp cable over jacket in junction box.
      b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.
   9. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
   10. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
   11. Keep runs short. Allow extra length for connecting to terminal boards. Do not bend flexible coaxial cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
   12. Ground wire shall be copper and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.
   13. Wire and cable shall be continuous from terminal to terminal without splices.
   14. Use insulated spade lugs for wire and cable connection to screw terminals.
   15. Use shielded cable to transmitters.
   16. Use shielded cable to temperature sensors.
   17. Perform continuity and meager testing on wire and cable after installation.
   18. Do not install bruised, kinked, scored, deformed, or abraded wire and cable. Remove and discard wire and cable if damaged during installation, and replace it with new cable.
   19. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
   20. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

21. Protection from Electro-Magnetic Interference (EMI): Provide installation free of (EMI). As a minimum, comply with the following requirements:
    a. Comply with BICSI TDMM and TIA 569-C for separating unshielded cable from potential EMI sources, including electrical power lines and equipment.
    b. Separation between open cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
        1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
    c. Separation between cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
        1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
    d. Separation between cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
        1) Electrical Equipment Rating Less Than 2 kVA: No requirement.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
    e. Separation between Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.
    f. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.09 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections. Installer Representative to work directly with the Owner's Representative.
    1. Perform visual and mechanical inspections.
    2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Testing:
    1. Perform pre-installation, in-progress, and final tests, supplemented by additional tests, as necessary.
    2. Pre-installation Cable Verification: Verify integrity and serviceability for new cable lengths before installation. This assurance may be provided by using vendor verification documents, testing, or other methods. As a minimum, furnish evidence of verification for cable attenuation and bandwidth parameters.
    3. In-Progress Testing: Perform standard tests for correct pair identification and termination during installation to ensure proper installation and cable placement. Perform tests in addition to those specified if there is any reason to question condition of material furnished and installed. Testing accomplished is to be documented by agency conducting tests.

4. Final Testing: Perform final test of installed system to demonstrate acceptability as installed. Testing shall be performed according to a test plan supplied by DDC system manufacturer. Defective Work or material shall be corrected and retested. As a minimum, final testing for cable system, including spare cable, shall verify conformance of attenuation, length, and bandwidth parameters with performance indicated.
5. Test Results: Recap test results in final Report.

3.10 DDC SYSTEM I/O CHECKOUT PROCEDURES

A. Check installed products before continuity tests, leak tests and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.

D. Control Damper Checkout:
1. Verify that control dampers are installed correctly for flow direction.
2. Verify that proper blade alignment, either parallel or opposed, has been provided.
3. Verify that damper actuator and linkage attachment is secure.
4. Verify that actuator wiring is complete, enclosed and connected to correct power source.
5. Verify that damper blade travel is unobstructed.

E. Control Valve Checkout:
1. Verify that control valves are installed correctly for flow direction.
2. Verify that valve body attachment is properly secured and sealed.
3. Verify that valve actuator and linkage attachment is secure.
4. Verify that actuator wiring is complete, enclosed and connected to correct power source.
5. Verify that valve ball, disc or plug travel is unobstructed.

F. Instrument Checkout:
1. Verify that instrument is correctly installed for location, orientation, direction and operating clearances.
2. Verify that attachment is properly secured and sealed.
3. Verify that conduit connections are properly secured and sealed.
4. Verify that wiring is properly labeled with unique identification, correct type and size and is securely attached to proper terminals.
5. Inspect instrument tag against approved submittal.
6. For instruments with tubing connections, verify that tubing attachment is secure and isolation valves have been provided.
7. For flow instruments, verify that recommended upstream and downstream distances have been maintained.
8. For temperature instruments:
   a. Verify sensing element type and proper material.
   b. Verify length and insertion.

3.11 DDC SYSTEM I/O ADJUSTMENT, CALIBRATION AND TESTING:

A. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.

B. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.

C. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.

D. Equipment and procedures used for calibration shall comply with instrument manufacturer's written instructions.

E. Provide diagnostic and test equipment for calibration and adjustment.

F. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. An installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.

G. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.

H. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.

I. Comply with field testing requirements and procedures indicated by ASHRAE's Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

J. Analog Signals:
   1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
   2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
   3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source.

K. Digital Signals:
   1. Check digital signals using a jumper wire.
   2. Check digital signals using an ohmmeter to test for contact making or breaking.

L. Control Dampers:
   1. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
   2. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed and 100 percent open at proper air pressure.
   3. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
   4. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

M. Control Valves:
   1. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
   2. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed and 100 percent open at proper air pressures.

3. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
4. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

N. Meters: Check sensors at zero, 50, and 100 percent of Project design values.

O. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

P. Switches: Calibrate switches to make or break contact at set points indicated.

Q. Transmitters:
1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistant source.

3.12 DDC SYSTEM CONTROLLER CHECKOUT

A. Verify power supply.
1. Verify voltage, phase and hertz.
2. Verify that protection from power surges is installed and functioning.
3. Verify that ground fault protection is installed.
4. If applicable, verify if connected to UPS unit.
5. If applicable, verify if connected to a backup power source.
6. If applicable, verify that power conditioning units, transient voltage suppression and high-frequency noise filter units are installed.

B. Verify that wire and cabling is properly secured to terminals and labeled with unique identification.

C. Verify that spare I/O capacity is provided.

3.13 DDC CONTROLLER I/O CONTROL LOOP TESTS

A. Testing:
1. Test every I/O point connected to DDC controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance.
2. Test every I/O point throughout its full operating range.
3. Test every control loop to verify operation is stable and accurate.
4. Adjust control loop proportional, integral and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
5. Test and adjust every control loop for proper operation according to sequence of operation.
6. Test software and hardware interlocks for proper operation. Correct deficiencies.
7. Operate each analog point at the following:
   a. Upper quarter of range.
   b. Lower quarter of range.
   c. At midpoint of range.
8. Exercise each binary point.

9. For every I/O point in DDC system, read and record each value at DDC controller and at field instrument simultaneously. Value displayed at DDC controller and at field instrument shall match.

3.14 DDC SYSTEM VALIDATION TESTS

A. Perform validation tests before requesting final review of system. Before beginning testing, first submit Pretest Checklist and Test Plan.

B. After approval of Test Plan, execute all tests and procedures indicated in plan.

C. After testing is complete, submit completed test checklist.

D. Pretest Checklist: Submit the following list with items checked off once verified:
   1. Detailed explanation for any items that are not completed or verified.
   2. Required mechanical installation work is successfully completed and HVAC equipment is working correctly.
   3. HVAC equipment motors operate below full-load amperage ratings.
   4. Required DDC system components, wiring, and accessories are installed.
   5. Installed DDC system architecture matches approved Drawings.
   6. Control electric power circuits operate at proper voltage and are free from faults.
   7. Required surge protection is installed.
   8. DDC system network communications function properly, including uploading and downloading programming changes.
   9. Using BACnet protocol analyzer, verify that communications are error free.
   10. Each controller's programming is backed up.
   11. Equipment, products, tubing, wiring cable and conduits are properly labeled.
   12. All I/O points are programmed into controllers.
   13. Testing, adjusting and balancing work affecting controls is complete.
   14. Dampers and actuators zero and span adjustments are set properly.
   15. Each control damper and actuator goes to failed position on loss of power.
   16. Valves and actuators zero and span adjustments are set properly.
   17. Each control valve and actuator goes to failed position on loss of power.
   18. Meter, sensor and transmitter readings are accurate and calibrated.
   19. Control loops are tuned for smooth and stable operation.
   20. View trend data where applicable.
   21. Each controller works properly in standalone mode.
   22. Safety controls and devices function properly.
   23. Interfaces with fire-alarm system function properly.
   24. Electrical interlocks function properly.
   25. Interfaces are delivered, all system and database software is installed and graphic are created.
   26. Record Drawings are completed.

E. Test Plan: Coordinate the following with the Owner’s representative.
   1. Prepare and submit a validation test plan including test procedures for performance validation tests.
   2. Test plan shall address all specified functions of DDC system and sequences of operation.
   3. Explain detailed actions and expected results to demonstrate compliance with requirements indicated.

4. Explain method for simulating necessary conditions of operation used to demonstrate performance.
5. Include a test checklist to be used to check and initial that each test has been successfully completed.
6. Submit test plan documentation 10 business days before start of tests.

F. Validation Test: Coordinate the following with the Owner's representative.
1. Verify operating performance of each I/O point in DDC system.
   a. Verify analog I/O points at operating value.
   b. Make adjustments to out-of-tolerance I/O points.
      1) Identify I/O points for future reference.
      2) Simulate abnormal conditions to demonstrate proper function of safety devices.
      3) Replace instruments and controllers that cannot maintain performance indicated after adjustments.
2. Simulate conditions to demonstrate proper sequence of control.
3. Readjust settings to design values and observe ability of DDC system to establish desired conditions.
4. Completely check out, calibrate, and test all connected hardware and software to ensure that DDC system performs according to requirements indicated.
5. After validation testing is complete, prepare and submit a report indicating all I/O points that required correction and how many validation re-tests it took to pass. Identify adjustments made for each test and indicate instruments that were replaced.

G. DDC System Response Time Test: Coordinate the following with the Owner's representative.
1. Simulate HLC.
   a. Heavy load shall be an occurrence of 50 percent of total connected binary COV, one-half of which represent an "alarm" condition, and 50 percent of total connected analog COV, one-half of which represent an "alarm" condition, that are initiated simultaneously on a one-time basis.
2. Initiate 10 successive occurrences of HLC and measure response time to typical alarms and status changes.
3. Measure with a timer having at least 0.1-second resolution and 0.01 percent accuracy.
4. Purpose of test is to demonstrate DDC system, as follows:
   a. Reaction to COV and alarm conditions during HLC.
   b. Ability to update DDC system database during HLC.
5. Passing test is contingent on the following:
   a. Alarm reporting at printer beginning no more than two seconds after the initiation (time zero) of HLC.
   b. All alarms, both binary and analog, are reported and printed; none are lost.
   c. Compliance with response times specified.
6. Prepare and submit a report documenting HLC tested and results of test including time stamp and print out of all alarms.

3.15 DDC SYSTEM WIRELESS NETWORK VERIFICATION

A. DDC system Installer shall design wireless DDC system networks to comply with performance requirements indicated.

B. Installer shall verify wireless network performance through field testing and shall document results in a field test report.

C. Testing and verification of all wireless devices shall include, but not be limited to, the following:
   1. Speed.
   2. Online status.
   3. Signal strength.

3.16 FINAL REVIEW

A. Submit written request to Architect and Construction Manager when DDC system is ready for final review. Written request shall state the following:
   1. DDC system has been thoroughly inspected for compliance with contract documents and found to be in full compliance.
   2. DDC system has been calibrated, adjusted and tested and found to comply with requirements of operational stability, accuracy, speed and other performance requirements indicated.
   3. DDC system monitoring and control of HVAC systems results in operation according to sequences of operation indicated.
   4. DDC system is complete and ready for final review.

B. Take prompt action to remedy deficiencies indicated in field report and submit a second written request when all deficiencies have been corrected. Repeat process until no deficiencies are reported.

C. A part of DDC system final review shall include a demonstration to parties participating in final review.
   1. Provide staff familiar with DDC system installed to demonstrate operation of DDC system during final review.
   2. Provide testing equipment to demonstrate accuracy and other performance requirements of DDC system that is requested by reviewers during final review.
   3. Demonstration shall include, but not be limited to, the following:
      a. Accuracy and calibration of 10 I/O points randomly selected by reviewers. If review finds that some I/O points are not properly calibrated and not satisfying performance requirements indicated, additional I/O points may be selected by reviewers until total I/O points being reviewed that satisfy requirements equals quantity indicated.
      b. HVAC equipment and system hardwired and software safeties and life-safety functions are operating according to sequence of operation. Up to 10 I/O points shall be randomly selected by reviewers. Additional I/O points may be selected by reviewers to discover problems with operation.
      c. Correct sequence of operation after electrical power interruption and resumption after electrical power is restored for randomly selected HVAC systems.
      d. Operation of randomly selected dampers and valves in normal-on, normal-off and failed positions.
      e. Reporting of alarm conditions for randomly selected alarms, including different classes of alarms, to ensure that alarms are properly received by operators.
      f. Trends, summaries, logs and reports set-up for Project.

g. For up to three HVAC systems randomly selected by reviewers, use graph trends to show that sequence of operation is executed in correct manner and that HVAC systems operate properly through complete sequence of operation including different modes of operations indicated. Show that control loops are stable and operating at set points and respond to changes in set point of 20 percent or more.
h. Software's ability to communicate with controllers, uploading and downloading of control programs.
i. Software's ability to edit control programs off-line.
j. Data entry to show Project-specific customizing capability including parameter changes.
k. Step through penetration tree, display all graphics, demonstrate dynamic update, and direct access to graphics.
l. Execution of digital and analog commands in graphic mode.
m. Spreadsheet and curve plot software and its integration with database.
n. Online user guide and help functions.
o. Multitasking by showing different operations occurring simultaneously on four quadrants of split screen.
p. System speed of response compared to requirements indicated.
q. For Each Network and Programmable Application Controller:
    1) Memory: Programmed data, parameters, trend and alarm history collected during normal operation is not lost during power failure.
    2) Operator Interface: Ability to connect directly to each type of digital controller with a portable PDA. Show that maintenance personnel interface tools perform as indicated in manufacturer’s technical literature.
    3) Standalone Ability: Demonstrate that controllers provide stable and reliable standalone operation using default values or other method for values normally read over network.
    4) Electric Power: Ability to disconnect any controller safely from its power source.
    5) Wiring Labels: Match control drawings.
    6) Network Communication: Ability to locate a controller's location on network and communication architecture matches Shop Drawings.
    7) Nameplates and Tags: Accurate and permanently attached to control panel doors, instrument, actuators and devices.
r. Communications and Interoperability: Demonstrate proper interoperability of data sharing, alarm and event management, trending, scheduling, and device and network management. Requirements must be met even if only one manufacturer's equipment is installed.
    1) Reading of Any Property: Demonstrate ability to read and display any used readable object property of any device on network.
    2) Set Point and Parameter Modifications: Show ability to modify set points and tuning parameters indicated. Modifications are made with messages and write services initiated by an operator using workstation graphics, or by completing a field in a menu with instructional text.
    3) Peer-to-Peer Data Exchange: Network devices are installed and configured to perform without need for operator intervention to implement Project sequence of operation and to share global data.

4) Alarm and Event Management: Alarms and events are installed and prioritized according to The Owner's Representative. Demonstrate that time delays and other logic are set up to avoid nuisance tripping. Show that operators with sufficient privileges are permitted.
5) Schedule Lists: Schedules are configured for start and stop, mode change, occupant overrides, and night setback as defined in sequence of operations.
6) Schedule Display and Modification: Ability to display any schedule with start and stop times for calendar year.
7) Archival Storage of Data: Data archiving is handled by server and local trend archiving and display is accomplished.
8) Modification of Trend Log Object Parameters: Operator with sufficient privilege can change logged data points, sampling rate, and trend duration.
9) Device and Network Management:
    a) Display of network device status.
    b) Display of BACnet Object Information.
    c) Silencing devices transmitting erroneous data.
    d) Time synchronization.
    e) Remote device re-initialization.
    f) Backup and restore network device programming and master database(s).
    g) Configuration management of routers.

3.17 EXTENDED OPERATION TEST

A. Extended operation test is intended to simulate normal operation of DDC system by The Owner. Coordinate the following with the Owner's representative.
    1. Operate DDC system for an operating period of 14 consecutive calendar days following Substantial Completion. Coordinate exact start date of testing with the Owner's representative.
    2. During operating period, DDC system shall demonstrate correct operation and accuracy of monitored and controlled points as well as operation capabilities of sequences, logs, trends, reports, specialized control algorithms, diagnostics, and other software indicated.
        a. Correct defects of hardware and software when it occurs.
    3. During operating period, log downtime and operational problems that are encountered, as follows:.
        a. Identify source of problem.
        b. Provide written description of corrective action taken.
        c. Record duration of downtime.
        d. Maintain log showing the following:
            1) Time of occurrence.
            2) Description of each occurrence and pertinent written comments for reviewer to understand scope and extent of occurrence.
            3) Downtime for each failed I/O point.
            4) Running total of downtime and total time of I/O point after each problem has been restored.
        e. Log shall be available to The Owner for review at any time.

4. For DDC system to pass extended operation test, total downtime shall not exceed 2 percent of total point-hours during operating period.
    a. Failure to comply with minimum requirements of passing at end of operating period indicated shall require that operating period be extended one consecutive day at a time until DDC system passes requirement.
5. Evaluation of DDC system passing test shall be based on the following calculation:
    a. Downtime shall be counted on a point-hour basis where total number of DDC system point-hours is equal to total number of I/O points in DDC system multiplied by total number of hours during operating period.
    b. One point-hour of downtime is one I/O point down for one hour. Three points down for five hours is a total of 15 point-hours of downtime. Four points down for one-half hour is 2 point-hours of downtime.
    c. Example Calculation: Maximum allowable downtime for 30-day test when DDC system has 1000 total I/O points (combined analog and binary) and has passing score of 1 percent downtime is computed by 30 days x 24 h/day x 1000 points x 1 percent equals 7200 point-hours of maximum allowable downtime.
6. Prepare test and inspection reports.

B. Definition of Failures and Downtime during Operating Period:
1. Failed I/O point constituting downtime is an I/O point failing to perform its intended function consistently and a point physically failed due to hardware and software.
2. Downtime is when any I/O point in DDC system is unable to fulfill its' required function.
3. Downtime shall be calculated as elapsed time between a detected point failure as confirmed by an operator and time point is restored to service.
4. Maximum time interval allowed between DDC system detection of failure occurrence and operator confirmation shall be 0.5 hours.
5. Downtime shall be logged in hours to nearest 0.1 hour.
6. Power outages shall not count as downtime, but shall suspend test hours unless systems are provided with UPS and served through a backup power source.
7. Hardware or software failures caused by power outages shall count as downtime.

3.18 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.19 TRAINING

A. Coordinate training with The Owner’s Representative.

B. Training Schedule:
1. Schedule training with The Owner’s Representative 10 business days before expected Substantial Completion.
2. Schedule training to provide The Owner’s Representative with at least 15 business days of notice in advance of training.
3. Training shall occur within normal business hours at a mutually agreed on time. Unless otherwise agreed to, training shall occur Monday through Friday, except on U.S. Federal holidays. Training, including breaks and excluding lunch period, shall not exceed eight hours per day.

4. Provide staggered training schedule as requested by The Owner's Representative.

C. Training Attendee List and Sign-in Sheet:
   1. Request from The Owner's Representative in advance of training a proposed attendee list with name, phone number and e-mail address.
   2. Provide a preprinted sign-in sheet for each training session with proposed attendees listed and no fewer than six blank spaces to add additional attendees.
   3. Preprinted sign-in sheet shall include training session number, date and time, instructor name, phone number and e-mail address, and brief description of content to be covered during session. List attendees with columns for name, phone number, e-mail address and a column for attendee signature or initials.
   4. Circulate sign-in sheet at beginning of each session and solicit attendees to sign or initial in applicable location.
   5. At end of each training day, send The Owner's Representative an e-mail with an attachment of scanned copy (PDF) of circulated sign-in sheet for each session.

D. Training Attendee Headcount:
   1. Plan in advance of training for five attendees.
   2. Make allowance for The Owner's Representative to add up to two attendee(s) at time of training.
   3. Headcount may vary depending on training content covered in session. Attendee access may be restricted to some training content for purposes of maintaining system security.

E. Attendee Training Manuals:
   1. Provide each attendee with a color hard copy of all training materials and visual presentations.
   2. Hard-copy materials shall be organized in a three-ring binder with table of contents and individual divider tabs marked for each logical grouping of subject matter. Organize material to provide space for attendees to take handwritten notes within training manuals.
   3. In addition to providing hard-copies of the training materials, also provide The Owner's Representative with an electronic copy of the training materials.

F. Instructor Requirements:
   1. Only qualified instructors are to provide training.
   2. Instructors shall be well versed in the software and programming of the software and have experience in presenting the materials in a training atmosphere.

G. Organization of Training Sessions:
   1. Organize training sessions into logical groupings of technical content and to reflect different levels of operators having access to system. Plan training sessions to accommodate the following levels of operators:
      a. Daily operators.
      b. System managers and administrators.
   2. Plan and organize training sessions to group training content to protect DDC system security. Some attendees may be restricted to some training sessions that cover restricted content for purposes of maintaining DDC system security.

H. Training Outline:
   1. Submit training outline for The Owner's Representative review at least 10 business day before scheduling training.

2. Outline shall include a detailed agenda for each training day that is broken down into each of four training sessions that day, training objectives for each training session and synopses for each lesson planned or as indicated by The Owner's Representative.

I. On-Site Training:
1. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
2. Provide as much of training located on-site as deemed feasible and practical by The Owner's Representative.
3. On-site training shall include regular walk-through tours, as required, to observe each unique product type installed with hands-on review of operation, calibration and service requirements.

J. Training Content for Daily Operators:
1. Basic operation of system.
2. Understanding DDC system architecture and configuration.
3. Understanding each unique product type installed including performance and service requirements for each.
4. Understanding operation of each system and equipment controlled by DDC system including sequences of operation, each unique control algorithm and each unique optimization routine.
5. Operating printers and other peripherals.
6. Logging on and off system.
7. Accessing graphics, reports and alarms.
8. Adjusting and changing set points and time schedules.
9. Recognizing DDC system malfunctions.
10. Understanding content of operation and maintenance manuals including control drawings.
11. Understanding physical location and placement of DDC controllers and I/O hardware.
12. Accessing data from DDC controllers.
13. Review of DDC testing results to establish basic understanding of DDC system operating performance and HVAC system limitations as of Substantial Completion.
14. Running each specified report and log.
15. Displaying and demonstrating each data entry to show Project-specific customizing capability. Demonstrating parameter changes.
16. Stepping through graphics penetration tree, displaying all graphics, demonstrating dynamic updating, and direct access to graphics.
17. Executing digital and analog commands in graphic mode.
18. Demonstrating control loop precision and stability via trend logs of I/O for not less than 10 percent of I/O installed.
19. Demonstrating DDC system performance through trend logs and command tracing.
20. Demonstrating scan, update, and alarm responsiveness.
21. Demonstrating spreadsheet and curve plot software, and its integration with database.
22. Demonstrating on-line user guide, and help function and mail facility.
23. Demonstrating multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.

24. Demonstrating the following for HVAC systems and equipment controlled by DDC system:
    a. Operation of HVAC equipment in normal-off, -on and failed conditions while observing individual equipment, dampers and valves for correct position under each condition.
    b. For HVAC equipment with factory-installed software, show that integration into DDC system is able to communicate with DDC controllers or gateways, as applicable.
    c. Using graphed trends, show that sequence of operation is executed in correct manner, and HVAC systems operate properly through complete sequence of operation including seasonal change, occupied and unoccupied modes, warm-up and cool-down cycles and other modes of operation indicated.
    d. Hardware interlocks and safeties function properly and DDC system performs correct sequence of operation after electrical power interruption and resumption after power is restored.
    e. Reporting of alarm conditions for each alarm, and confirm that alarms are received at assigned locations.
    f. Each control loop responds to set point adjustment and stabilizes within time period indicated.
    g. Sharing of previously graphed trends of all control loops to demonstrate that each control loop is stable and set points are being maintained.

K. Training Content for Advanced Operators:
    1. Detailed Content will be by The Owner's Representative.

L. Training Content for System Managers and Administrators:
    1. DDC system software maintenance and backups.
    2. Uploading, downloading and off-line archiving of all DDC system software and databases.
    3. Interface with Project-specific, third-party operator software.
    4. Understanding password and security procedures.
    5. Adding new operators and making modifications to existing operators.
    6. Operator password assignments and modification.
    7. Operator authority assignment and modification.
    8. Workstation data segregation and modification.

END OF SECTION **230900**

SECTION 230993 – SEQUENCE OF OPERATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes control sequences for DDC for Firing Range HVAC systems, subsystems, and equipment.

B. Related Requirements:
   1. Section 230900, Instrumentation and Controls
   2. Section 233400, HVAC Fans
   3. Section 235416, Furnaces
   4. Section 238126, Split-System Air-Conditioners

1.02 GENERAL

A. Setpoints listed below are to be adjustable, unless otherwise noted.

B. Provide 5-degree (non-adjustable) minimum deadband limit between adjustable heating and cooling lockout temperatures.

C. Static pressures indicated are differential pressures between the range indicated and outdoors.

1.03 MAKEUP AIR UNIT TEMPERATURE CONTROLS

A. Lockout gas burner operation when outside air temperature is 68-degrees F or higher.

B. Lockout ACCU-1 operation while outside air temperature is less than 73-degrees F.

C. Gas burners modulate to maintain discharge air temperature of 70-degree F, while outside air temperature is 65-degrees F or lower.

D. ACCU-1 refrigeration circuits modulate to maintain discharge air temperature of 75-degree F, subject to cooling lockout setpoint.

1.04 FIRING RANGE HVAC SYSTEM CONTROL SEQUENCES

A. One Range in Occupied mode:
   1. MAU-1 inlet damper is commanded open.
   2. Supply air damper associated with occupied range is commanded open.
   3. Exhaust air damper associated with occupied range is commanded open.
   4. Upon both supply air and exhaust air dampers associated with occupied range prove open, along with MAU-1 inlet damper. perform the following:
      a. Energize both exhaust fan and MAU-1 supply fan at the lowest speed setting.
      b. Modulate speed of both fans to maintain a maximum static pressure range of +/- 0.2 inches water column in occupied range until MAU-1 supply fan is at Occupied range speed setpoint.
      c. Modulate exhaust fan speed as required to maintain occupied range space pressurization of negative 0.1-inches water column once MAU-1 supply fan is at Occupied range speed setpoint.
   5. EF-1 operate continuously during occupied mode.
   6. MAU-1 operate continuously during occupied mode. See Article 1.03.

B. Both Ranges in Occupied mode:
   1. MAU-1 inlet damper is commanded open.
   2. Supply air dampers associated with each range is commanded open.
   3. Exhaust air dampers associated with each range is commanded open.
   4. If MAU-1 was not already energized perform the following once all dampers are proven open:
      a. Energize both exhaust fan and MAU-1 supply fan at the lowest speed setting.
      b. Modulate speed of both fans to maintain a maximum static pressure range of +/- 0.2 inches water column in both ranges until MAU-1 supply fan is at speed setpoint for both ranges occupied.
      c. Modulate exhaust fan speed as required to maintain a static pressure range of negative 0.05 to negative 0.2-inches water column in both ranges once MAU-1 supply fan is at speed setpoint for both ranges occupied.
   5. If MAU-1 was already operating, perform the following:
      a. Modulate the speed for both MAU-1 and EF-1. Limit rate of change of speed modulation of both MAU-1 and EF-1 to maintain a static pressure range of negative 0.05 to negative 0.2-inches water column in both ranges until MAU-1 supply fan is at speed setpoint for both ranges occupied.
      b. Modulate exhaust fan speed as required to maintain a static pressure range of negative 0.05 to negative 0.2-inches water column in both ranges once MAU-1 supply fan is at speed setpoint for both ranges occupied.
   6. EF-1 operate continuously during occupied mode.
   7. MAU-1 operate continuously during occupied mode. See Article 1.03.

C. One Range in Unoccupied mode, other Range is still in Occupied mode:
   1. Supply air damper associated with unoccupied range is commanded closed.
   2. Exhaust air damper associated with unoccupied range is commanded closed.
   3. Modulate MAU-1 supply fan speed to speed setting of Occupied range speed setpoint. See Article 1.03.
      a. Limit rate of change of speed modulation of both MAU-1 and EF-1 to maintain a static pressure range of negative 0.05 to negative 0.2-inches water column in occupied range.
      b. Modulate exhaust fan speed as required to maintain occupied range space pressurization of negative 0.1-inches water column.

D. Both Ranges in Unoccupied mode:
   1. Verify ACCU-1 minimum runtime timer is not active then de-energize ACCU-1.
   2. Lockout gas burner operation.
   3. Modulate both MAU-1 and EF-1 to their lowest speed setting, while maintain a maximum static pressure range of +/- 0.2 inches water column in both ranges.
   4. Once one of the fans reaches their lowest speed setting, de-energize both MAU-1 and EF-1.
   5. MAU-1 inlet damper is commanded closed.
   6. Supply air dampers associated with each range is commanded closed.
   7. Exhaust air dampers associated with each range is commanded closed.

E. General notes:
   1. Ranges are to be in unoccupied mode during building occupancy, subject to user input.

2. Provide user override to bring either or both ranges into occupied mode for up to 2-hours while building is scheduled to be in unoccupied mode.

F. Alarms:
1. Any damper fails to open within 2-minutes (adjustable) of being commanded open.
2. Alarms associated with equipment built-in controls.
3. Exhaust fan fails to start.
4. Differential pressure in either range exceeds 0.3-inches static positive or negative.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION **230993**

SECTION 231123 – NATURAL GAS PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes piping, pipe fittings, and incidental related items as required for complete gas piping systems.

1.02 REFERENCES

A. ANSI: American National Standards Institute

B. ASME: American Society of Mechanical Engineers

C. ASTM: American Society for Testing and Materials

D. CGA: Compressed Gas Association

E. IFGC: International Fuel Gas Code

F. MSS: Manufacturers Standardization Society

G. NFPA: National Fire Protection Association

1.03 SUBMITTALS

A. Product Data: For ball valves and gas pressure regulators.

B. Test Reports and Certificates: Certificates of inspections and pipe tests.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Piping material and installation shall meet requirements of the local plumbing, fire, and building codes and serving utility requirements.

B. Pipe Cleaning: Should any pipe be plugged, disconnect piping, reclean, and reconnect without additional expense to the contract.

C. Correct any damage to the building or systems resulting from failure to properly clean the system without additional expense to the contract.

PART 2 PRODUCTS

2.01 BLACK STEEL PIPE, SCHEDULE 40

A. Pipe: Schedule 40, in accordance with ASTM A120 or A53.

B. Fittings: 150-pound screwed malleable iron on 2 inches and below. Cold press fitting system listed by NFPA 54, IFGC, and ANSI LC-4/CSA 6.32 such as Viega MegaPress G is acceptable for outdoor use when installed per system manufacturer’s written installation instructions.

2.02 VALVES AND SPECIALTY ITEMS

A. Ball valve: 2-piece, full port, brass body, chrome plated brass ball, threaded, with handle, 400 psi CWP, UL listed for gas use, Complies with ANSI Z21.15, and ASME B 16.44.

B. Gas Cock: Forged brass body, hard chromium plated forged brass ball, threaded, with handle, for 1/2 psi to 5 psi gas use, 400 psi CWP, tested to ANSI Z21.15, CGA 91-002 and ASME B 16.44.

C. Gas Pressure Regulator:
   1. Acceptable Manufacturers:
      a. Maxitrol
      b. Or Approved.
   2. 2 PSI to Inches water column: Aluminum body complying with ANSI Z21.80, maximum inlet pressure of 2 psi, aluminum orifice, molded BUNA-N soft seat, BUNA-N diaphragm, ball check vent limiting device.
   3. 5 PSI to 2 PSI: Aluminum body complying with ANSI Z21.80, aluminum orifice, molded BUNA-N soft seat, BUNA-N diaphragm. Inlet pressure of 5 psi, regulator shall be rated at 60 psi inlet pressure under abnormal conditions without damage to internal regulator components.
   4. Provide ANSI Z21.80 listed and approved vent limiter or route vent discharge to building exterior.

PART 3 EXECUTION

3.01 PIPING INSTALLATION

A. Install unions in all non-flanged piping connections to apparatus and adjacent to all screwed valves, traps, and appurtenances requiring removal for servicing, located so that piping may be disconnected without disturbing the general system.

B. Support all piping independently so that its weight is not carried by the equipment.

C. Run piping clear of tube cleaning or removal/replacement access area on coils, etc.

D. Route piping at right angles or parallel to building walls where exposed. Route piping tight to walls and bottom of roof structure. Install piping to allow for valve servicing. Piping to be free of sags and bends.

3.02 PIPING JOINTS

A. Join pipe and fittings using methods and materials recommended by the manufacturer, in accordance with standard practice and applicable codes. Cleaning, cutting, reaming, grooving, etc., shall be done with proper tools and equipment. Hacksaw pipe cutting is prohibited. Peening of welds to stop leaks is not permitted.

B. Steel Piping:
   1. Screwed Joints: Cut pipes evenly with pipe cutter, and ream to full inside diameter, with all burrs and cuttings removed. Joints shall be made up with suitable lubricant or Teflon tape, applied to male threads only, leaving two threads bare. Tighten joints so not more than two threads are left showing. Make junctions between galvanized steel waste pipe and bell of cast iron pipe with tapped spigot or half coupling on steel pipe to form spigot end, and caulk.

C. Screwed Joints: Use Teflon tape or Teflon liquid dope applied to male threads only.

3.03 I

3.04 NSTALLATION, VALVES

A. Provide valves at connections to equipment where shown or required for equipment isolation.

B. Install all valves accessible and same size as connected piping.

C. Provide separate support for valves where necessary.

D. Provide gas pressure regulators at equipment connections per drawings and associated gas connection details.

3.05 VALVE IDENTIFICATION

A. Identify valves to indicate their function and system served.

3.06 ADJUSTING AND CLEANING

A. General: Clean interior of all piping before installation.

3.07 TESTING:

A. Natural Gas at 14-inch water column and lower: 10-PSIG Pneumatic test pressure for a minimum 4-hours with no loss of pressure. Locate and repair leaks.

B. Natural Gas above 14-inch water column: 60-PSIG Pneumatic test pressure for a minimum 4-hours with no loss of pressure. Locate and repair leaks.

END OF SECTION **231123**

SECTION 232113 – HVAC PIPING

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes piping, pipe fittings, and incidental related items as required for complete piping systems.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230050, Basic Mechanical Materials and Methods

B. Section 230529, Hangers and Supports

C. Section 230548, Mechanical Vibration and Seismic Controls

D. Section 230553, Mechanical Identification

E. Section 230713, Mechanical Insulation

F. Section 231123, Natural Gas Piping

1.03 REFERENCES

A. ANSI: American National Standards Institute

B. ASTM: American Society for Testing and Materials

C. AWWA: American Water Works Association

D. CDA: Copper Development Association

E. IEEE: Institute of Electrical and Electronics Engineers

F. NEC: National Electric Code

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Piping material and installation shall meet requirements of the local building codes and serving utility requirements.

B. Pipe Cleaning: Should any pipe be plugged or should foaming of water systems occur, disconnect piping, reclean, and reconnect without additional expense to the Owner.

C. Correct any damage to the building or systems resulting from failure to properly clean the system without additional expense to the Owner.

D. Refrigerant piping systems:
   1. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.
   2. Comply with ASME B31.5: Refrigerant Piping and Heat Transfer Components.
   3. Products shall comply with UL 207 "Refrigerant–Containing Components and Accessories, "Nonelectrical"; or UL 429 "Electrical Operated Valves."

PART 2 PRODUCTS

2.01 PVC PIPE, SCHEDULE 40

A. Pipe: Schedule 40 PVC pipe in accordance with ASTM F891, D1784, and D2665

B. Fittings: PVC DWV fittings in accordance with ASTM D1784 and D2665.

C. Glued Joints: Primer shall comply with ASTM F656. Solvent Cement shall comply with ASTM D2564.

D. Service: Condensate drains.

2.02 COPPER TUBE

A. Tubing: Hard drawn copper tubing, Type L, ASTM B88.

B. Fittings: Wrought copper, 150 psi, solder joint type, DWV pattern.

C. Service: Condensate drains.

2.03 REFRIGERATION TUBING:

A. Tubing: Drawn copper tubing, Type ACR, ASTM B280.
   1. Provide hard-drawn tubing for refrigeration systems with a nominal cooling capacity over 5-tons.
   2. Soft drawn tubing is acceptable for refrigeration systems with a nominal cooling capacity 5-tons and less.

B. Fittings: Wrought copper, ASME B16.22, brazed joint type.

C. Service: Refrigeration lines for split systems (Joints shall be brazed).

D. Accessories for commercial split systems over 5-tons:
   1. Isolation Valves (where not provided factory installed on condensing unit): UL-listed, solid brass construction, 700-psig design pressure/maximum working pressure.
   2. Sight glass: Double-ported type having heavy sight glasses sealed into forged bronze body and incorporating means of indicating refrigerant charge and moisture indication. Provide screwed brass seal caps.
   3. Thermal expansion valves: Comply with ARI 750. Brass body with stainless-steel or non-corrosive nonferrous internal parts, diaphragm and spring-loaded (direct-operated) type with sensing bulb and distributor having side connection for hot-gas bypass and external equalizer. Size and operating characteristics as recommended by manufacturer of evaporator and factory set for superheat requirements. Solder-end connections. Testing and rating in accordance with ASHRAE Standard 17.

2.04 JOINING MATERIALS FOR COPPER

A. Solder Filler Metals: ASTM B32, lead-free alloys. Include ASTM B813 water-flushable flux.

B. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for copper to copper joints. BAg-1, silver alloy for copper to bronze or steel joints.

C. Refrigerant Brazing Filler Metals: Cadmium free, AWS A5.8/A5.8M, 45 percent silver brazing alloy, Class BAg-5.

2.05 UNIONS

A. Unions shall be 150 psi malleable iron or brass, brass to iron seat, ground joint, black or galvanized to match pipe. 200 psi WOG bronze, ground joint, solder type for copper tubing. Use of dielectric unions is not permitted.

2.06 PIPING, HANGERS, SUPPORTS, ANCHORAGE, AND SEISMIC RESTRAINTS

A. Conform to the requirements of Section 230529, Hangers and Supports; and Section 230548, Mechanical Vibration and Seismic Controls.

2.07 FLEXIBLE CONNECTORS

A. Expansion Joint for Refrigerant Piping: Bronze hose and braid with copper sweat ends.

PART 3 EXECUTION

3.01 PIPING INSTALLATION

A. Piping installed in areas of relative inaccessibility or in areas where leakage could cause significant damage shall not use mechanical couplings. Piping in these areas shall be soldered or welded. Areas include enclosed vertical shafts, above IT rooms, above electrical rooms, above hard lid ceilings, and as indicated on the drawings.

B. Install unions in all non-flanged or non-mechanical coupling piping connections to apparatus and adjacent to all screwed valves, traps, and appurtenances requiring removal for servicing, located so that piping may be disconnected without disturbing the general system.

C. Install all piping to vent and drain.

D. Support all piping independently so that its weight shall not be carried by the equipment.

E. Run piping clear of tube cleaning or removal/replacement access area on coils, etc.

F. Route piping at right angles or parallel to building walls. Install piping to allow for valve servicing. Piping to be free of sags and bends.

G. Expansion Joints/Seismic Connectors: Install where piping crosses building expansion joints and where indicated on drawings. Install in accordance with the manufacturer's instructions.

3.02 PIPING JOINTS

A. Join pipe and fittings using methods and materials recommended by the manufacturer, in accordance with standard practice and applicable codes. Clean, cut, ream, groove, etc., with proper tools and equipment. Hacksaw pipe cutting is prohibited. Peening of welds to stop leaks is not permitted.

B. Copper Piping:
   1. Soldered Joints: Cut pipe evenly with cutter, ream to full inside diameter; end of pipe and inside of fitting thoroughly cleaned and polished. Joint shall be uniformly heated, and capillary space completely filled with solder, leaving full bead around entire circumference.
   2. Brazed Joints: All joints using mechanically extracted collars shall be brazed in accordance with the Copper Development Association's Copper Tube Handbook using B-cup series filler metal. Soft solder joints will not be accepted.

C. Screwed Joints: Use Teflon tape or Teflon liquid dope applied to male threads only.

3.03 ADJUSTING AND CLEANING

A. General: Clean interior of all piping before installation.

B. Check out, start up, and test the following items: Heat trace cables and accessories.

3.04 TESTING

A. Refrigerant piping: Minimum 4-hours pneumatic nitrogen test with no loss of pressure. Test suction lines at 300-PSIG, Hot gas and liquid lines at 535-PSIG. Locate and repair leaks.

END OF SECTION **232113**

SECTION 233113 – HVAC DUCTWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes ductwork, flexible ducts, and exposed ductwork for typical building HVAC applications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230050, Basic Mechanical Materials and Methods

B. Section 230529, Hangers and Supports

C. Section 230548, Mechanical Vibration and Seismic Controls

D. Section 230553, Mechanical Identification

E. Section 230713, Mechanical Insulation

F. Section 233300, Duct Accessories

G. Section 230593, Testing, Adjusting, and Balancing

1.03 REFERENCES

A. NFPA: National Fire Protection Association

B. OMSC: Oregon Mechanical Specialty Code

C. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association

D. UL: Underwriters Laboratories

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Work performed by qualified, experienced mechanics, in accordance with the SMACNA HVAC Duct Construction Standards and these specifications.

B. Regulatory Requirements:
   1. Flame and Smoke Ratings: Installed composite flame spread not to exceed 25 and smoke developed not to exceed 50 as tested by UL 723.
   2. Sheet Metal Ductwork, Flexible Ducts, and Exposed Ductwork:
      a. Entire ductwork system, including materials and installation, shall be installed in accordance with NFPA 90A.
      b. Ductwork and components shall be listed as UL 181, Class I air duct; flame rating shall not exceed 25 and smoke rating shall not exceed 50.

PART 2 PRODUCTS

2.01 HANGERS, SUPPORTS, ANCHORAGE, SEISMIC RESTRAINTS, AND SEISMIC CONTROL

A. Provide hangers, supports, anchorage, seismic restraints, and seismic control for products specified herein in accordance with the requirements of the contract documents and SMACNA "HVAC Duct Construction Standards."

2.02 SHEET METAL DUCTWORK (MAU-1 SUPPLY DUCTWORK)

A. Fabricate from G90 galvanized steel, unless noted otherwise on the drawings.

B. Minimum gauge, duct construction, joint reinforcing, and fittings shall be in accordance with SMACNA "HVAC Duct Construction Standards - Metal and Flexible."

C. Duct Classification: Construct the supply ductwork in accordance with minimum reinforcement requirements for static pressure class of 4-inch W.G. positive or negative.

D. Longitudinal seams on rectangular duct shall be Pittsburgh or Button punch snap lock, or equivalent.

E. For rectangular ductwork joining and reinforcing systems shall be either shop fabricated to SMANCA requirements or manufactured by Ductmate. Ductmate 35 is equivalent to SMACNA "J," and Ductmate 25 is equivalent to SMACNA "F."

F. Fittings:
   1. Transitions of concentric type or eccentric type to maintain elevations detailed, with not more than 35-degree angle variation on sloped portion.
   2. Rectangular elbows: Mitered elbows with turning vanes.
   3. Rectangular mains to round branches: Spin-in

2.03 INDUSTRIAL DUCTWORK (EXHAUST DUCTWORK)

A. Fabricate from G90 galvanized steel, unless noted otherwise on the drawings.

B. Minimum gauge, duct construction, joint reinforcing, and fittings shall be in accordance with SMACNA "Rectangular Industrial Duct Construction Standards" and "Round Industrial Duct Construction Standards"
   1. Subject to SMACNA standards above, construct exhaust ductwork with a minimum wall thickness of 18-gage.

C. Construct ductwork in accordance with minimum reinforcement requirements for static pressure class of 6-inch W.G. negative.

D. Fittings:
   1. Ductwork fittings to be minimum two gages thicker than straight ductwork.
   2. Transitions of concentric type or eccentric type to maintain elevations detailed, with not more than 45-degree angle variation on sloped portion.
   3. Rectangular elbows: Mitered elbows with turning vanes.

E. Flexible connections: 6-inch face-to-face arch style rubber duct expansion joint with ⅛-inch thick Viton™ expansion material. Acceptable Manufacturers: Flexicraft, Holz Rubber Company, or Approved.

PART 3 EXECUTION

3.01 APPLICATIONS

A. HVAC Supply Air Ductwork: Galvanized Sheet metal, lined where double-wall construction of insulation thickness to comply with ASHRAE 90.1-2019 is not used. Refer to Section 230713, Mechanical Insulation.

B. Exhaust Ductwork: Galvanized steel.

3.02 INSTALLATION

A. Sheet Metal Ductwork:
   1. Seal all joints and seams with an approved mastic during joining procedure or tape after joining to provide airtight duct system. Ductwork to meet SMACNA Seal Class A requirements. Ductwork subject to pressure testing shall have a SMACNA Leakage Class rating of 6 or less.
      a. Exposed ductwork: Sealant to match color of ductwork paint. Sealant edges shall be straight with no irregularities or feathering.
   2. Hang, support, restrain, and control movement and vibration of ductwork systems, equipment, and components in accordance with the requirements of the contract documents and applicable SMACNA standard noted in Part 2. Do not use wire supports.
   3. Provide supplementary steel for support of ductwork in shafts and between building structural members.
   4. Fabricate changes in direction to permit easy air flow, using full 1.5D radius bends.
   5. Change in duct size or shape necessitated by interference shall be made using rectangular equivalents of equal velocity.
   6. Where pipe, structural member, or other obstruction passes through a duct, provide streamlined sheet metal collar around member and increase duct size to maintain net free area. Fit collar and caulk to make airtight.

B. Sound Attenuation (Internal Insulation):
   1. Provide sound attenuation duct in accordance with Section 230713, Mechanical Insulation.
   2. Duct dimensions shown are net inside attenuating/insulating material.

C. Dampers: Install where shown and where required. Install regulators as specified. Leave all dampers locked wide open.

D. Flexible Connectors: Make connections to fans and other rotating equipment with flexible connectors with 2-inch minimum clearance between casing and ductwork.

E. Spin-In Fittings for concealed locations only:
   1. Install at branch take-offs to outlets using round or flex duct.
   2. Connect to flexible duct with draw band strap and minimum of two wraps of duct tape.
   3. Leave all dampers locked wide open.

F. Exterior Ductwork:
   1. Replace all dented or damaged sections.
   2. Install ductwork straight and true, parallel to building lines.
   3. Remove all excess sealant to provide a finished joint.
   4. Paint all ductwork and hangers. Color as selected by Owner's Representative.
   5. Finish and clean all ductwork and hangers.

3.03 TESTING

A. Check out, start up, and test systems, equipment, and components specified herein.

B. Coordination with Balancing Agency:
   1. Provide the services of a sheet metal firm familiar with the system ductwork to assist the balancing agency during the initial phases of air balancing in locating all sheet metal dampers.

2. Install missing dampers.

C. Exterior Ductwork:
1. Test all exterior ductwork at associated static pressure class rating, in compliance with SMACNA's "HVAC Air Duct Leakage Test Manual".
2. System overall leakage is limited to 2% of design airflow.

D. Indoor Supply Ductwork:
1. Test all square duct systems and 50 percent of oval and spiral duct systems at 4-inch static pressure, in compliance with SMACNA's "HVAC Air Duct Leakage Test Manual".
2. System overall leakage is limited to 2% of design airflow.

E. Indoor Exhaust Ductwork:
1. Test all ductwork at associated static pressure class rating, in compliance with SMACNA's "HVAC Air Duct Leakage Test Manual".
2. System overall leakage is limited to 2% of design airflow.

END OF SECTION **233113**

SECTION 233300 – DUCT ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes HVAC duct accessories, sealants, flexible connectors, access doors, drain pans, filter racks and filters.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230713, Mechanical Insulation

B. Section 230900, Instrumentation and Controls

C. Section 233113, HVAC Ductwork

1.03 REFERENCES

A. NFPA: National Fire Protection Association

B. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association, Inc.

1.04 SUBMITTALS

A. For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.
   1. Include the manufacturer’s installation instructions.

1.05 QUALITY ASSURANCE

A. Work shall be performed by qualified, experienced mechanics in accordance with SMACNA and these specifications.

B. Install entire ductwork system, including materials and installation, in accordance with NFPA 90A.

C. Flexible connectors, flexible equipment connections, tapes and sealants shall be listed as UL 181, Class I air duct; flame spread rating shall not exceed 25 and smoke developed rating shall not exceed 50.

PART 2 - PRODUCTS

2.01 HVAC DUCT ACCESSORIES

A. Bell Mouth Fittings: Round or flat oval, radius of 0.20 D minimum.

B. Flexible Equipment Connections for supply ductwork: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 24-gauge, galvanized sheet steel. Fabric strip shall be glass fabric coated in neoprene.

C. Turning Vane Assemblies:
   1. Sheet Metal Vanes: Multiple radius hollow vane air foil type 2-inch (small vane) or 4 1/2-inch (large vane) inside radius, galvanized steel construction.
   2. Runners: Push-on type.

3. Acoustical Vanes: Multiple radius air foil type, perforated steel construction with fiberglass fill.

D. Access Doors:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following: Elgen, Greenheck, Nailor, or equivalent.
2. Doors shall be complete with steel frame, steel door with backing plate, cam latches (two on units 14-inch by 14-inch and larger), hinge and gasketing. Doors on insulated or lined ducts shall be insulated.
3. Size:

Duct Width or Duct Diameter	Net Access Door Opening
Up to 8"	6" x 6"
9" to 12"	8" x 8"
13" to 20"	12" x 12"
21" to 30"	16" x 14"
31" to 42"	18" x 14"
Over 42"	Two 16" x 14"

E. Balancing dampers to be factory fabricated with 20-gauge galvanized steel frame and blades, 0.5-inch plated steel axle and synthetic bearings, along with external manual quadrant actuator.
1. Single blade dampers shall be reinforced or crimped for rigidity, with jackshaft extending through duct. Dampers over 12 inches high shall use multiple opposed blade damper. Single blade damper shall be no larger than 12 inches by 48 inches with a maximum 6-inch distance from shaft to edge of blade.
2. Butterfly dampers shall be fabricated of 18-gauge galvanized steel.
3. Dampers shall be of length suitable to close branch ducts without damper flutter.
4. Damper blade shall be aligned with handle and index pointer.

F. Drip Pans: Provide Type 304 stainless steel drip pans for cooling coils.

G. Sealants: Comply with UL-181M along with SMACNA pressure and sealing classes. Mold, mildew and water resistant. Shall be low VOC emitting and for indoor applications shall be water-based.

2.02 AUTOMATIC CONTROL DAMPERS

A. Acceptable Manufacturers: Ruskin, Greenheck, Nailor, Pottorff, or approved.

B. Control dampers to be leakage class 1A per AMCA 500-D. Frames to be galvanized steel structural hat channel construction. Damper blades to be galvanized steel airfoil shape with neoprene blade edge and jamb seals. Concealed linkage and 0.5-inch plated steel axle and synthetic bearings, along with external 24-Volt AC 2-position spring return closed actuator(s).

2.03 HEPA FILTER FRAME

A. Acceptable Manufacturers: AAF Flanders model Surelock-B, Camfil model GlidePack

Multitrack 25, or approved.

B. HEPA filter frame suitable for 12-inch HEPA filters with minimum 2-inch thick prefilters.
   1. Frame to accommodate the following number of 24x24 filters: 4-high, 6-wide.
   2. Factory fabricated with minimum 16-gage galvanized steel suitable for 6-inches water gauge negative pressure.
   3. Maximum 1% leakage of housing at 3-inches water gauge.
   4. Prefilters tracks to have gasketing to limit leakage.
   5. HEPA filters to be either individually secured for positive sealing or have track gasketing to limit leakage to maximum 1% at 3-inches water gauge.
   6. Access doors to be hinged with neoprene gasketing and adjustable latches.

2.04 FILTERS

A. Acceptable Manufacturers: AAF Flanders, Camfil, or approved.

B. Prefilter: 2-inch thick, pleated, minimum MERV8, maximum 0.25-inches water gauge initial pressure drop at 500-FPM.

C. HEPA filter: 11.5-inch thick, high capacity HEPA filter with 0.3 micron particle efficiency of 99.99%. Maximum 1.3-inches water gauge initial pressure drop at 500-FPM.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install all devices in accordance with the manufacturer's recommendations.

B. Install duct accessories in accordance with Section 233113, HVAC Ductwork.

C. Access Doors: Install where indicated and at all automatic control dampers, fire dampers, and air flow stations to provide access for cleaning and maintenance.

D. Automatic Control Dampers: Install in accordance with Section 230900, Instrumentation and Controls of HVAC Systems. Coordinate damper operators with Section 230900.

E. Provide initial filters and one set of replacement filters. Install initial filters after exhaust system ductwork is cleaned after installation per Section 233113 and prior to testing.

3.02 TESTING

A. Check out, start up, and test systems, equipment, and components specified herein.

END OF SECTION **233300**

SECTION 233400 – HVAC FANS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes utility set fans.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230050, Basic Mechanical Materials and Methods

B. Section 230529, Hangers and Supports

C. Section 230548, Mechanical Vibration and Seismic Controls

D. Section 230553, Mechanical Identification

E. Section 230593, Testing, Adjusting, and Balancing

F. Section 230900, Instrumentation and Controls

G. Section 233300, Duct Accessories

1.03 REFERENCES

A. AFBMA: Anti-Friction Bearing Manufacturers Association

B. NFPA: National Fire Protection Association

1.04 SUBMITTALS

A. For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.
   1. Shop Drawings: Include dimensions and details of construction.
   2. Product Data: Include performance of fans.
   3. Provide certified sound power ratings for each fan.

B. For systems, equipment, and components specified herein, submit commissioning plans and schedules; checkout, startup, operational, functional and final acceptance test plans, procedures, checklists, and reports; and operation and maintenance training plans.

PART 2 PRODUCTS

2.01 UTILITY SET FANS

A. Acceptable Manufacturers:
   1. Greenheck Fan Corporation
   2. Loren Cook Company
   3. PennBarry
   4. Twin City Fan
   5. or approved.

B. Fan housing and outlet
   1. Fan housing to be aerodynamically designed with integral punched flanges for an upblast discharge suitable for Class II.

2. Fan housing shall be constructed of rolled steel with a continuous seam weld.
3. Housing to be coated with a minimum of 3 mils of an electrostatically applied and baked polyester urethane. Coating must exceed 1,000-hour salt spray under ASTM B117 test method.
4. Motor support framework to be constructed of structural steel that is suitable to handle the weights of the motor and propeller. All support framework to be coated with a minimum of 3 mils of an electrostatically applied and baked polyester urethane. Coating must exceed 1,000-hour salt spray under ASTM B117 test method.

C. Fan Wheel
1. Fan wheel shall use steel backward inclined airfoil blades. The fan shall be both statically and dynamically balanced.
2. Provide with polished solid steel shaft.

D. Motor: Integrally mounted, 1800 rpm, with pre-lubricated sealed ball bearings. See Section 230050, Basic Mechanical Materials and Methods, for further motor requirements.

E. Drive: Provide belt drive units with VFDs for speed control and balancing. See Section 230900, Instrumentation and Controls for VFD requirements. VFD to be in either a NEMA 3R, 4, or 4X housing if installed on fan housing or on roof.

F. Accessories:
1. Weatherhood for motor and belt.
2. Bolted housing access dor.
3. 1-inch drain connection with threaded plug
4. Extended copper lube lines
5. Outlet guard.
6. No fan mounted inlet or outlet dampers. Control dampers shown on drawings will be used for isolation and shutoff.

PART 3 EXECUTION

3.01 UTILTIY SET FANS

A. Install in accordance with the manufacturer's instructions.

B. Mount on isolators as specified, see Structural Drawings.

C. Provide flexible connections on inlet duct connections.

D. Lubricate bearings as recommended by the bearing manufacturer.

E. Connect ductwork using flexible connections.

F. Startup: After installation and before starting:
1. Check fan isolation for freedom of motion.
2. Statically and dynamically balance fan as an assembly, with a maximum full amplitude shaft deflection at bearings not to exceed 0.001 inch at 1200 rpm.
3. Engage the manufacturer to perform pre-startup and startup tasks.

3.02 COMMISSIONING

A. Commission the systems, equipment, and components specified herein.

END OF SECTION **233400**

SECTION 237423 – MAKEUP AIR UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes gas-fired makeup air units.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230050, Basic Mechanical Materials and Methods

B. Section 230529, Hangers and Supports

C. Section 230548, Mechanical Vibration and Seismic Controls

D. Section 230553, Mechanical Identification

E. Section 230593, Testing, Adjusting, and Balancing

F. Section 230900, Instrumentation and Controls

G. Section 232113, HVAC Piping

H. Section 231123, Natural Gas Piping

I. Section 238126, Split System Air Conditioners

1.03 REFERENCES

A. ANSI: American National Standards Institute

B. FM: FM Global

C. NEC: National Electrical Code

D. OSHA: Occupational Safety and Health Administration

1.04 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the UL or ETL label.

B. Gas fired units shall be rated in accordance with ANSI Z21.47 and 10 CFR Part 431.

1.05 SUBMITTALS

A. For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.
   1. Shop Drawings: Include dimensions and details of construction.
   2. Product Data: Show performance data, standard items and accessories, and operating weight.

B. For systems, equipment, and components specified herein, submit commissioning plans and schedules; checkout, startup, operational, functional and final acceptance test plans, procedures, checklists, and reports; systems manuals; and operation and maintenance training plans.

PART 2 PRODUCTS

2.01 MAKE-UP AIR UNIT (MAU)

A. Acceptable Manufacturers:
   1. Weather Rite
   2. Engineered Air
   3. Hastings
   4. or approved.

B. Description: Single zone direct fired unit consisting of weatherhood section, filter section, cooling coil section, fan section, and heating section all contained in an insulated steel casing mounted on a common steel base. Arrange components in order indicated on the drawings. Unit shall be ETL listed to ANSI standards.

C. Unit Casing:
   1. Casing shall be minimum 16-gage steel, reinforced and braced. Caulk and seal all seams to make unit water and air tight. Support unit on continuous steel supports with intermediate angle and channel framework. Fan casing section shall be minimum 14-gage steel.
   2. Provide access for inspection of fan and motor, filters, dampers, and other components. Provide continuous perimeter of closed cell neoprene gasket to form an airtight seal.
   3. Factory applied enamel finish, color as selected by Owner's Representative from factory standard color offerings.
   4. Insulation of walls, bottom, and top shall be minimum 1-inch-thick rigid fiberglass in compliance with UL181 for mold growth and erosion. Insulation installation to comply with NFPA 90A.

D. Fans, Motors, and Drives: Single width, single inlet centrifugal fans with backward inclined airfoil Class II fan wheel, heavy duty industrial prelubricated bearings, multiple v-belt adjustable drives, external motor on adjustable base, belt guard. Maximum rpm shall not exceed 75 percent of first critical speed.

E. Vibration Isolation: Provide as an integral part of the fan and motor assembly with 1 1/2-inch static deflection Type 5 isolators. Provide flexible connections between fan and casing.

F. Filters: 2-inch MERV8 pleated filters mounted on a V-bank filter rack suitable for matching fan cabinet dimensions. V-bank design to result in filter velocities of 400-FPM or less at specified airflow.

G. Dampers: Provide multi-blade inlet dampers.

H. Burner: Modulating type specifically designed to burn natural gas below the maximum non-contaminating level required by OSHA. The burner shall have heat resistant stainless steel burner plates. The burner shall have a turndown ratio with 100 percent thermal efficiency to limit lowest fire rate temperature rise to 2.5-degree F at design airflow. The air velocity across the burner shall be constant at all times. Burner shall be suitable for 8 inches W.C. gas service.

I. Provide gas safety controls to meet FM Global requirements and include a flame safeguard relay with timed prepurge and ultraviolet flame sensing. Provide automatic and manual high temperature limits at the discharge of the unit and a high temperature safety located at the burner. Burner assembly and gas manifold shall be completely pre-piped and factory tested.

J. The gas temperature controls shall be electronic with accuracy to +/- 0.2ºF. The nominal turndown ratio shall be 25:1 with total control between high and low fire. Provide the unit with pre purge time delay and arranged for positive low fire startup.

K. Refrigerant Coils: Provide indoor coils of non-ferrous construction. Provide one coil per Air cooled condensing unit circuit, minimum 2-coils. Basis of design is for 2-coils, one per refrigeration circuit. Protect coils with plywood covers during shipment and installation. Evaporator coil drain pan shall be internally sealed and insulated. Drain pans shall comply with ASHRAE 62.1-2019 requirements. Coil construction shall be one of the following:
1. Aluminum fins mechanically bonded to seamless copper tubing with all joints brazed
2. Cast aluminum microchannel coils.

L. Controls shall be UL listed and shall include fan starters and overloads, control circuit fuses, high temperature limit switch, flame safeguard, ignition transformer, automatic pilot valve, main gas automatic safety shutoff valve, modulating control system, air proving differential switch, control transformer, and disconnect switch.

M. Control panel shall contain all standard electrical components such as fused disconnect switches, motor starters, 24-volt transformers, control circuit fuses, flame relay, low temperature limit switch, high temperature limit switch, low gas pressure, and coded terminal strip and safety and operating pilot lights.

N. Electrical: Internally wired for single point electrical connection in accordance with NEC.

O. Controls:
1. Refer to Section 230900, Instrumentation and Controls, for sequence of operation. Coordinate with work of this section to interface unit controls with building control system.

PART 3 - EXECUTION

3.01 GENERAL MAKEUP AIR UNIT INSTALLATIONS

A. Installation:
1. Install curb.
2. Install and level unit and secure to structure per Contract Documents.
3. Make piping connections. Provide minimum 2-inch trap seal on all condensation drain connections. Refer to Section 232113 HVAC piping for refrigerant lines and condensate drains. Refer to Section 231123, Natural Gas piping for gas piping.
   a. Condensate drain trap assembly shall be cleanable without removing from unit.
   b. Drain to terminate per one of the following:
      1) Over nearest roof drain assembly.
      2) Over a replaceable splash block with a maximum vertical drop of 6-inches from drain to block.
4. Install unit. Air filters shall be in place before operating unit. Comply with manufacturer's recommendation.
5. Keep access door to roof-mounted equipment closed to prevent wind and weather damage.

3.02 COMMISSIONING

A. Commission systems, equipment, and components specified herein.

B. Factory trained and authorized personnel are required to perform the following startup services.
   1. Comply with the manufacturer's instructions.
   2. Install filters before operating unit.
   3. Provide unit startup under the direct supervision of the manufacturer's representative with factory trained personnel.

END OF SECTION **237423**

SECTION 238126 – SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes split-system air cooled condensing units to serve Makeup Air Unit cooling coil(s).

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230050, Basic Mechanical Materials and Methods

B. Section 230529, Hangers and Supports

C. Section 230548, Mechanical Vibration and Seismic Controls

D. Section 230553, Mechanical Identification

E. Section 230593, Testing, Adjusting, and Balancing

F. Section 230900, Instrumentation and Controls

G. Section 232113, HVAC Piping

H. Section 237423, Makeup Air Units

1.03 REFERENCES

A. NEC: National Electrical Code

1.04 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

B. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210/240 and bear the ARI Certification label.

1.05 SUBMITTALS

A. For systems, equipment, and components specified herein, submit product/material data; shop drawings; operation and maintenance data; as-constructed data; installation, startup, and testing manuals; operation and maintenance manuals; and as-constructed drawings.
   1. Shop Drawings: Include dimensions and details of construction.
   2. Product Data: Show performance data, standard items and accessories, and operating weight.

B. For equipment and components specified below, submit commissioning plans and schedules; checkout, startup, operational, functional and final acceptance test plans, procedures, checklists, and reports; systems manuals; and operation and maintenance training plans.

PART 2 PRODUCTS

2.01 COMMERCIAL AIR COOLED CONDENSING UNITS (OVER 5-TONS)

A. Provide unit acceptable to makeup unit manufacturer's requirements, see Section 237423.

B. Air-Cooled Condensing Unit:
   1. Description: Provide air-cooled condensing units designed for outdoor installation with factory supplied supports, properly assembled and tested at the factory. Unit shall be completely weatherproofed and include compressor, condenser coils, condensing fans, motor, refrigerant reservoir, charging valve, all controls, and a holding charge of nitrogen. Provide guards on condenser fans and coil guard.
   2. Compressors: Furnish hermetically sealed scroll type with isolation and sound muffling. Units shall have overload and inherent winding thermostat protection to prevent burnout. Provided crankcase heater. Multiple compressors shall be manifolded for dual circuit connections on liquid and suction lines.
   3. Refrigeration Circuits: Include backseating service valve and gauge ports in liquid and suction lines. Provided refrigerant filter-dryer and isolation valves on each line.
   4. Condenser Coil: Non-ferrous construction consisting of aluminum plate fins mechanically bonded to seamless copper tubes with microchannels and circuited for subcooling. Condenser coil shall have coil protection screens on to prevent coil damage.
      a. Provide unit with coil hail/vandal guard.
   5. Condenser Fans and Motors: Direct-driven propeller type fans with permanently lubricated motors.
   6. Hot gas bypass for capacity control is prohibited.
   7. Controls: Provide high and low pressure cutouts, contactors and internal overload protection on all motors. Provide short cycle timer. Unit controller to be compatible with MAU system controls.
   8. Supports: Provide structural steel support. Submit for review before fabrication.

PART 3 - EXECUTION

3.01 GENERAL SPLIT-SYSTEMS INSTALLATIONS

A. Installation:
   1. Install and level unit and secure to structure.
   2. For on-grade equipment installation, provide concrete housekeeping pad for installation. Housekeeping pad to be minimum 6-inches beyond equipment footprint.
   3. Provide interconnecting wiring from evaporator, condenser, and control panel. Provide interconnecting piping between makeup air unit and condensing unit. Size and run refrigerant piping between condensing unit and makeup air unit in accordance with the manufacturer's instructions. Provide double discharge risers recommended by the manufacturer. See Section 232113 "HVAC Piping" for refrigerant piping.
   4. Provide refrigerant accessories noted in manufacturer's written installation instructions. See Section 232113 "HVAC Piping" for additional refrigerant accessories.

3.02 COMMISSIONING

A. Commission systems, equipment, and components specified herein.

B. Startup:
   1. Comply with the manufacturer's instructions.
   2. Provide air-conditioning unit startup under the direct supervision of the manufacturer's representative with factory-trained personnel.

END OF SECTION **238126**

Cundiff Engineering, Inc.
7007 S.W. Cardinal Lane, Suite 145
Portland, Oregon 97225
Telephone: 503.521 7260
Fax: 503.521 7257

Project: Clackamas County Public Safety Training Center - Firing Range HVAC Replacement
Project No.: 21-036
Date: March 02, 2022
By: Pedro Alzaga, P.E.

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SECTION 260100 – BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes general requirements for electrical installations.

1.02 SUBMITTALS

A. Submit for approval, submittal documents as required in each Specification Section.
   1. Submit all shop drawings and product data grouped to include submittals of relate systems, products, and accessories in a single electronic submittal in PDF format.
   2. Each submittal shall be indexed according to Specification Section.
   3. Each Specification Section shall be a separate file.
   4. Create PDFs at native size and right-side up; illegible files and secured files will be rejected.
   5. Mark dimensions and values in units to match those specified.

B. No apparatus or equipment shall be shipped or fabricated until submittal documents for same have been reviewed and returned, “no exceptions taken” or “make corrections noted”.

C. Products List: Include the following:
   1. Manufacturer’s name and address.
   2. Catalog designation or model number.
   3. Equipment schedule number (cross referenced from drawings).
   4. Rough-in data and dimensions.
   5. Detailed drawings, including manufacturers catalog numbers showing all components.

1.03 DEFINITIONS

A. Provide: Except to the extent further defined, the term “provide” means to furnish and install, complete and ready for the intended use.

B. Specification Language: Imperative language is used, generally, throughout the Specifications. Requirements expressed imperatively are to be performed by the Contractor. For clarity at certain locations, contrasting subjective language is used to describe responsibilities which must be performed by the Contractor or, when so noted, will be performed by others.

C. Equipment Specified and Specified Equipment: Equipment that is identified in schedules, specifications, and drawing notes.

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, crawl spaces, and tunnels.

E. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and electrical equipment rooms.

F. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

1.04 RECORD DOCUMENTS

A. Prepare record documents to indicate the following installed conditions:
   1. Equipment locations (exposed and concealed), dimensioned from prominent structural building lines.
   2. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.05 SPECIFICATIONS COMPLIANCE

A. The requirements of these specifications shall be complied with in every respect. Therefore, it shall be absolutely mandatory that the job foreman, subcontractors and their foreman have completely studied the Drawings and these specifications (The Contract Documents), be completely knowledgeable as to their entire contents, and maintain a copy at the job-site. Every foreman shall be provided with a complete copy of this specification.

1.06 CONTRACT DOCUMENTS

A. Contract Documents for Work are in part diagrammatic, intended to convey the scope of Work and indicate general arrangement of equipment, wiring, and approximate locations of equipment connections, lighting and outlets. Do not scale the Contract Documents for measurements.

B. Outlets or equipment shown on the Drawings with no indication shall be completed in the same method and manner as similar outlets or equipment shown on the Drawings.

C. The Contractor shall follow the Contract Documents in laying out the work, to become familiar with all conditions affecting the work and shall verify all spaces in which the work will be installed.

D. Where job conditions require reasonable changes in indicated locations or arrangements, make changes without additional cost to the Owner.

E. The Contract Documents and Specifications are to be cooperative and whatever is called for by either shall be binding as if called for by both.

1.07 USE OF EQUIPMENT

A. The use of any equipment or any part thereof, for purposes other than testing, even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor shall it be construed to obligate the Owner in any way to accept improper work or defective materials.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 DAMAGE TO OTHER WORK

A. The Contractor shall be responsible for damage done to existing equipment, structures, systems, etc., which damage is a direct or indirect result of this work. Such damage will be repaired at the expense of the Contractor to the full satisfaction of the Owner.

3.02 OPERATING INSTRUCTIONS

A. Instruct the Owner's personnel in the care, operation and maintenance of all apparatus and equipment.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

END OF SECTION **260100**

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. General electrical installation requirements.
   2. Cutting and Patching.
   3. Cleaning requirements.

1.02 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

B. Install electrical equipment to facilitate service, maintenance, and repair or replacement of components.

3.02 COOPERATION WITH OTHER TRADES

A. The Contractor shall cooperate with other trades to avoid interferences in the work and to avoid delays in the construction.

B. Interference, which occurs as a result of poor coordination or lack of cooperation, shall be corrected at the Contractor’s expense.

3.03 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.04 CUTTING AND PATCHING

A. Perform cutting and patching as follow:
   1. During cutting and patching operations, protect adjacent installations.
   2. Patch all holes, gaps, penetrations, etc. left by the removal of Electrical systems, equipment, and components indicated.

B. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

C. Patch finished surfaces and building components using new materials to match existing.

3.05 PROTECTION OF EQUIPMENT

A. After delivery, before and after installation, protect equipment and materials against theft, injury or damage from all causes.

B. The Contractor shall receive, properly house, handle, hoist, and deliver to proper location, equipment and other materials required.

C. The Contractor shall protect all materials and equipment in accordance with manufacturers' instructions.
   1. Protect UV sensitive products from direct sunlight.
   2. Support products to prevent sagging and bending.
   3. Provide climate controlled storage as required for equipment and materials where ambient conditions exceed allowable storage conditions.

3.06 CLEANING AND FINISHING

A. During the construction period, the Contractor shall remove all debris, rubbish, tools, equipment, unused materials, etc., as required and/or requested by the Owner.

B. Keep the premises in a clean and orderly condition during construction, removing all dirt, debris, etc.

C. Upon completion, the entire installation shall be thoroughly cleaned, all rubbish removed and the installation left to the satisfaction of the Owner. Thoroughly clean all Electrical fixtures and equipment, including interior and exterior surfaces, to completely remove: construction dust and dirt. Conduct a final inspection of the work, and insure that the piping has been cleaned and placed in complete and satisfactory working order.

END OF SECTION **260500**

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS & CABLES

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes wires, cables, and connectors.

1.02 REFERENCES

A. ASTM: American Society for Testing and Materials:
   1. ASTM B8: Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
   2. ASTM B33: Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
   3. ASTM B172: Standard Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors
   4. ASTM B189: Standard Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes

B. ICEA: Insulated Cable Engineers Association
   1. ICEA 566-524: Cross-Linked Thermosetting Polyethylene Insulated Wire and Cable for Transmission and Distribution of Electrical Energy
   2. ICEA S-95-658: Non-shielded 0-2 kV Cable
   3. ICEA S-75-381: Portable and Power Feeder Cables for Use in Mines and Similar Applications

C. NEC: National Electric Code
   1. NEC Article 336: Power and Control Tray Cable, Type TC

D. NEMA: National Electrical Manufacturers Association
   1. NEMA WC 58: Portable and Power Feeder Cables for Use in Mines and Similar Applications
   2. NEMA WC 70: Power Cables Rated 2000 V or Less for the Distribution of Electrical Energy

E. UL: Underwriters Laboratories:
   1. UL 44: Thermoset-Insulated Wires and Cable
   2. UL 83: Thermoplastic-Insulated Wires and Cables
   3. UL 1277: Standard for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members
   4. UL 1581: Reference Standard for Electrical Wires, Cables, and Flexible Cords

1.03 SUBMITTALS

A. Submit the following materials:
   1. Lighting and receptacle circuit conductors.
   2. Single conductor 600-volt power and control conductors.
   3. Multi-conductor 600-volt power cable.
   4. Multi-conductor 600-volt control cable.
   5. Direct burial, multi-conductor 600-volt cable.
   6. Portable cord.

7. Portable cable fittings.

B. Submittals of the following materials shall consist only of a listing of the manufacturer's name and the applicable catalog numbers of the items to be utilized. Upon review of the list, further information may be requested.
   1. Connectors.
   2. Branch circuit conductor splices.
   3. Splices with compression fitting and heat-shrinkable insulator.

C. Submit cable test data per testing requirements of Part 3.

PART 2 PRODUCTS

2.01 GENERAL

A. With the exception of lighting and receptacle circuits, the type, size, and number of conductors shall be as specified on the drawings or schedules. Lighting and receptacle circuit conductors are unscheduled and shall be sized in accordance with the NEC to limit voltage drop to 3 percent.

2.02 COLOR CODING

A. Power Conductors: Single-conductor power conductors shall have the following color codes for the indicated voltage:

	480/277V	208/120V	240/120V
Phase A	Brown	Black	Black
Phase B	Orange	Red	Red
Phase C	Yellow	Blue	--
Ground	Green	Green	Green
Neutral	Gray	White	White or Gray*

* If installed with 480/277V or 208/120V in the same raceway, box, gutter, or other enclosure, 240/120V neutral conductor color shall differ from the other system neutral conductor per NEC 200.6(D).

B. Multi-conductor power cable color coding shall be the manufacturer's standard.

C. Cables sized No. 4 AWG and larger may be black with 3/4 inch vinyl colored plastic tape applied in 3 inch lengths around the cable at each end. The cables shall be colored at terminations and in pull boxes, handholes, and manholes.

2.03 LIGHTING AND RECEPTACLE CIRCUIT CONDUCTORS

A. Lighting and receptacle circuit conductors shall be stranded except for No. 12 AWG which may be solid. Minimum conductor size shall be No. 12 AWG.

B. Conductors shall have the following characteristics:
   1. Voltage: 600 volts.
   2. Conductor: Bare annealed copper, stranded in accordance with ASTM B8.
   3. Insulation:
      a. Dry Areas and Above Grade: THWN/THHN, 90ºC dry, 75ºC wet, polyvinylchloride (PVC) in accordance with UL 83
      b. Dry/Wet Areas & Below Grade: XHHW, 90ºC dry, 75ºC wet, cross linked polyethylene in accordance with UL 44.
   4. Jacket: Nylon. Not applicable.
   5. Flame Resistance: UL 83. UL 44.
   6. Manufacturer: Cablec, Essex, Okonite, Southwire, or equal.

2.04 POWER CONDUCTORS AND CABLE, 600 VOLT

A. Single Conductor:
   1. Single conductor cable shall be stranded and used in conduits for power and control circuits. Unless otherwise specified, minimum size for power applications shall be No. 12 AWG and minimum size for control applications shall be No. 14 AWG.
   2. Conductors installed in cable tray shall be UL labeled, Type TC, designated for cable tray, installation in accordance with NEC Article 336.
   3. Conductors shall have the following characteristics:
      a. Voltage: 600 volts.
      b. Conductor: Coated, Class B, stranded annealed copper in accordance with ASTM B8.
      c. Insulation:
         1) Dry Areas & Above Grade: THWN/THHN, 90ºC dry, 75ºC wet, polyvinylchloride (PVC) in accordance with UL 83.
         2) Dry/Wet Areas & Below Grade: XHHW, 90ºC dry, 75ºC wet, cross linked polyethylene in accordance with UL 44.
      d. Flame Resistance: IEEE 383 flame test. UL 44, UL 83.
      e. Manufacturer: Anixter, Cablec, Essex, Okonite, Southwire, or equal.

B. Multi-Conductor Cable: Multi-conductor cable may be used for power and control circuits. Cables shall be UL labeled, Type TC, designed for cable tray installation in accordance with NEC Article 336. The type of insulation, number of conductors, and size of conductor shall be as specified.
   1. Power Cable:
      a. Multi-conductor power cable shall contain two, three, or four conductors, as specified, plus an equipment grounding conductor. Unless otherwise specified, minimum conductor size shall be No. 12 AWG.
      b. Cable shall be provided with the following characteristics.
         1) Voltage: 600 volts.
         2) Conductors: Annealed copper, stranded in accordance with ASTM B8, coated in accordance with ASTM B33.

3)	Insulation:	Ethylene propylene in accordance with UL 1581.
4)	Overall Jacket:	Chlorosulfonated polyethylene (CSPE) in accordance with UL 1277. Minimum thickness 45 mils.
5)	Flame Resistance:	210,000 Btu/hr flame test, UL 1277.
6)	Manufacturer:	Anixter, Okonite, or equal.

2.05 DIRECT-BURIED CABLE

A. Cable for direct burial shall be multi-conductor MC cable. Cable shall be suitable for direct burial, suitable to be encased in concrete, and suitable for normal or Class 1, Division 2 atmospheres. Cable characteristics shall be as follows:

1.	Voltage:	600 volts.
2.	Conductor:	Bare annealed stranded copper. Size and number of conductors shall be as specified on the circuit schedule.
3.	Insulation:	Insulation shall be type XHHW, meeting ICEA 566 524 and UL 44.
4.	Assembly:	The individual conductors shall be cabled together with non-hydroscopic fillers and binder tape overall. An impervious, continuously corrugated aluminum sheath shall be welded over the cable core with a black flame-retardant PVC jacket of not less than 50 mils extruded over the armor. Non-welded type sheath is not acceptable. The armor shall meet the grounding conductor requirements of Table 250-95 of the NEC and UL requirements.
5.	Manufacturer:	Anixter, Cablec, Gardex, Okonite, Rockbestos, or equal.

2.06 PORTABLE CORD

A. Portable cord shall be UL listed, type SO for sizes No. 10 AWG and smaller. Cords shall contain an equipment grounding conductor. Cord characteristics shall be as follows:

1.	Conductors:	Flexible rope stranded in accordance with ASTM B189 and B33. Conductors shall be coated except ground conductors may be uncoated.
2.	Insulation:	Insulation shall be ethylene propylene (EPR) or water resistant synthetic rubber (EPDM) and rated for continuous operation at 90° C.
3.	Jacket:	Heavy-duty neoprene.
4.	Manufacturer:	Anixter, or equal.
5.	Compliance:	Meets or exceeds electrical and physical requirements of ICEA S-95-658/NEMA WC-70.

B. Cords with conductors larger than No. 10 AWG shall be 600 volt, UL and/or MSHA listed, Type G. Cords shall contain an equipment grounding conductor. Cord characteristics shall be as follows:

1.	Conductors:	Flexible rope stranded in accordance with ASTM B172 and B33. Conductors shall be coated except ground conductors may be uncoated
2.	Insulation:	Insulation shall be ethylene propylene (EPR) or oil and water resistant synthetic rubber (EPDM) and rated for continuous operation at 90°C.
3.	Jacket:	Extra heavy-duty thermoset CSPE.
4.	Manufacturer:	AIWC, Amercable, or equal.
5.	Compliance:	Meets or exceeds electrical and physical requirements of ICEA S-75-381/NEMA WC-58.

2.07 SPLICING AND TERMINATING MATERIALS

A. 600-Volt Conductor and Cable Connectors:
   1. Connectors shall be one-piece tool applied compression type of correct size and UL listed for the specific application. Connectors shall be tin-plated electrolytic copper. Connectors for wires No. 10 AWG and smaller shall be self-insulating ring tongue or locking spade terminals. Connectors for No. 8 AWG and larger shall be one-hole lugs up to size No. 3/0 AWG and two-hole or four-hole lugs for size No. 4/0 and larger. Mechanical clamp or screw type connectors are not acceptable.
   2. 120-Volt Branch Circuit Conductor Splices: Live spring type, Scotch-Lok, Ideal Wing Nut; self-stripping type, 3M Series 560; or equal.
   3. 600-Volt Branch Circuit Conductor Splices: #10 and #12 conductors may be live spring type, Scotch-Loc, Ideal Wing Nut; self-stripping type, 3M series 560; or equal.
   4. Only use in-line splices and taps where specifically called for on the drawings or by written consent of the Owner. Splices shall be compression type, made with a compression tool die approved for the purpose, as made by Thomas and Betts Corp., or equal. Splice shall be covered with a heat-shrinkable sleeve or boot.

B. Portable Cable Fittings: Portable cable fittings for terminating the cable shall provide a watertight seal between the cord and the terminator and between the terminator and mounting hub. The cable terminator shall have a neoprene liner which grips the cord jacket when the back-nut on the fitting is tightened. In addition, on all pendant cord applications and other applications where called for, there shall be a stainless steel wire mesh cord grip as an integral part of the cord terminator.

PART 3 EXECUTION

3.01 GENERAL

A. Wire shall be continuous between each end of a conduit. Splices and terminals are not permitted within a conduit run.

B. Each main and branch circuit shall have its own dedicated neutral conductor. Do not install shared or common neutrals.

C. Pull wire and cable into conduit or trays without damaging or putting undue stress on the cable insulation. UL listed pulling compounds are acceptable lubricants for pulling wire and cable. Grease is not acceptable. Raceway construction shall be complete, cleaned, and protected from the weather before cable is placed.

D. Provide a cable support whenever a cable leaves a raceway.

E. When flat bus bar connections are made with unplated bar, scratch-brush the contact areas. Torque bolts to the bus manufacturer's recommendations.

3.02 600-VOLT CONDUCTORS AND CABLE

A. Incoming wire in panels, No. 6 AWG and smaller, shall be bundled and laced at intervals not greater than 6 inches, and neatly spread into trees and connected to their respective terminals. Allow sufficient slack in cables for alterations in terminal connections. Lace with plastic cable ties or linen lacing twine.

B. Where plastic panel wiring duct is provided for wire runs, lacing is not necessary when the wire is properly installed in the ducts. Provide slack in junction and pull boxes and in handholes and manholes. Amount of slack shall be equal to the largest perimeter dimension of the box.

C. Wire crossing hinges shall be stranded and made up into groups not exceeding 12 and shall be arranged so that they will be protected from chafing when the hinged member is moved.

D. Terminate stranded wire as described in Part 2 except where terminals will not specifically accept such terminations. In these cases, terminate the wires directly on the terminal block. Install compression lugs and connectors using manufacturer's recommended tools.

E. Solid wire shall not be lugged. Do not use electrical spring connectors, set screws, wire nuts, and wing nut connectors on anything other than solid wires in lighting and receptacle circuits. Install lugs and connectors with a compression tool.

F. All splices and terminations are subject to inspection prior to and after insulating. Terminations at 460-volt motors shall be made by bolt-connecting the lugged connectors. Insulate and seal connections with factory-engineered kits. Motor connection kits shall consist of heat shrinkable, polymeric insulating material over the connection area and a high dielectric-strength mastic to seal the ends against moisture and contamination. Keep bolt connection area free of mastic and fillers to facilitate rapid stripping and re-entry. Motor connection kits shall accommodate a range of cable sizes for both in-line and stub-type configurations. Connection kits shall be independent of cable manufacturer's tolerances.

G. In-line splices and tees (where approved) shall be made with tubular compression connectors and insulated with factory-engineered kits. Kits shall consist of heat shrinkable, polymeric insulating material over the connection area and a high dielectric strength mastic to seal the ends against moisture and contamination. Keep connection area free of mastic and fillers to facilitate rapid stripping and re-entry. Wires No. 10 AWG and smaller may be spliced using self-insulating connectors as specified in Part 2.

H. In-line splices and tees (where approved) shall be made with tubular compression connectors and insulated as specified above for motor terminations, except that wires No. 10 AWG and smaller may be spliced using self-insulating connectors as specified in Part 2.

I. Insulate splices and tees in underground handholes or pull boxes using Scotch-cast epoxy resin splicing kits. Provide conductor and cable markers at splice and termination points and use self-insulating tubular compression connectors.

J. Make terminations at solenoid valves, 120 volt, and other devices furnished with pigtail leads using self-insulating tubular compression connectors.

3.03 PORTABLE CORD

A. Portable cord feeding permanent installations, such as pumps, cranes, hoists, and portable equipment, shall have a wire mesh cord grip of flexible stainless steel wire to take tension from the cable termination. Use weatherproof strain relief fittings for all connections. Use 45 degree and 90 degree connectors where applicable to prevent unnecessary strain on cords. Flexible cords feeding submersible motors shall be of a non-wicking neoprene construction. Connect portable cords to permanent wiring with terminals. Use in-line taps and splices only where specified.

B. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless steel, wire-mesh, strain relief device at terminations to suit application.

3.04 FIELD TESTING

A. 600-volt rated conductors greater than or equal to 500 kcmil, or in parallel runs, shall be tested by the Contractor for continuity and shall be meggered after installation and prior to termination. Provide the megger, rated 1,000 volts d.c., and record and maintain the results, in tabular form, clearly identifying each conductor being tested; submit copies. Repeat testing after any cables are replaced.
   1. Replace cables when test value is less than 15 megohms.
   2. Cable test submittal shall include results, equipment used, date, and the Owner inspector's signature.

3.05 EXISTING CIRCUITS

A. Confirm the destination and purpose of each existing circuit before connecting to new equipment and new wiring. Connections shown on the one-line diagram drawing are the preferred connections.

B. Remove existing terminations leaving as much existing cable as possible. Conserve existing cable when making splices to new cables. Existing cable length may require different routings within manhole vaults than are shown on the drawings. Do not unnecessarily cut off any existing cable length.

END OF SECTION **260519**

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes a grounding system including a conduit system, equipment grounding conductor, transformer housings, a switchboard frame and neutral bus, motors, and miscellaneous grounds. Work also includes a 600V insulated main bonding jumper for service connection between the ground bus in the switchgear lineup and a ground termination point or service ground in the transformer.

1.02 REFERENCES

A. NEC: National Electrical Code: NEC Article 250: Grounding and Bonding.

PART 2 PRODUCTS

2.01 GROUND CONDUCTORS

A. Bare or green insulated copper for interior systems.

2.02 CONNECTORS

A. Cast, set screw, or bolted allowed in dry locations only.

B. Form poured, exothermic welds.

C. Compression-tool applied. Burndy “Hyground Compression System,” or equal.

D. Grounding lugs where furnished as standard manufacturer’s items on equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Size grounding conductors in accordance with National Electrical Code (NEC) Article 250, Tables 250-66 and 250-122.

B. Underground connections shall be exothermic applied.

C. Grounding conductor connectors shall be made up tight and located for future servicing and to ensure low impedance.

D. All plug-in receptacles shall be bonded to the boxes, raceways and grounding conductor.

E. Provide equipment grounding conductor in all conduit runs.

F. Provide ground bond for all conduits terminated at or near cable trays, including communication and data conduits provided for cabling to the cable tray.

3.02 EQUIPMENT

A. Provide separate green insulated equipment ground conductor for all circuits. Effectively ground all fixtures, panels, controls, motors, disconnect switches, exterior lighting standards, and non-current-carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, buses, etc., for this purpose.

B. Provide grounding bushings on all feeder conduit entrances to panels and equipment enclosures and bond bushings to enclosures with minimum No. 10 AWG conductor. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through No. 10 AWG.

C. Ground Pads:
   1. Drill and tap ground pads as necessary for attachment of all grounding conductors.
   2. Use two-hole lugs for terminating No. 4/0 AWG and larger ground conductors.
   3. Bond ground pads to adjacent structural steel with #3/0 bare copper cable, using form-poured exothermic welds.

END OF SECTION **260526**

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes supporting devices for electrical equipment, associated conduit, and cable.

1.02 REFERENCES

A. IBC: International Building Code
   1. IBC Chapter 16: Structural Design

1.03 SUBMITTALS

A. Submit shop drawings and calculations for seismic anchorage and bracing for the vertical and lateral restraint of conduit, cable trays, bus ducts, and electrical equipment as required by IBC Chapter 16. Shop drawings and calculations shall bear the seal of a professional engineer registered in the state of Oregon.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Hangers: Kindorf B-905-2A channel, H-119-D washer, C105 strap, minimum 1/2-inch rod with ceiling flange, or equal.

B. Hot dip galvanized finish.

C. Pipe Straps: Two-hole galvanized or malleable iron.

D. Support of Open Cabling: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide all electrical equipment supports.

B. Install vertical support members for equipment, straight and parallel to building walls.

C. Provide independent supports to structural member for electrical fixtures, materials, or equipment installed in or on ceiling, walls, or in void spaces and/or over furred or suspended ceilings.

D. Do not use other trades' fastening devices to support electrical equipment materials or fixtures.

E. Do not use supports and/or fastening devices to support other than one particular item.

F. Support conduits within 18 inches of outlets, boxes, panels, cabinets, and deflections.

G. Provide complete seismic anchorage and bracing for the vertical and lateral restraint of conduit, cable trays, bus ducts, and electrical equipment as required by IBC Chapter 16 and the SMACNA Seismic Restraint Manual - Guidelines for Mechanical Systems, for SHL A.

H. Building Attachments:
   1. Where possible, support all conduit, cable tray, and equipment from structural members, beams, and joists.
   2. Provide structural steel angles, channels, or other members to support conduit, cable tray, and equipment where structural members do not occur as required for proper support.
   3. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at joist panel points or provide web reinforcing as required.
   4. Do not fasten or attach to unfilled steel roof deck structure.
   5. Attach to concrete-filled steel floor deck structure for loads up to 400 pounds. Loads larger than 400 pounds shall be designed per code. Submit structural calculations stamped and signed by a structural engineer licensed in the State of Oregon showing that the concrete-filled floor deck has sufficient capacity to support the load at the points of anchorage.

3.02 PULL AND JUNCTION BOXES

A. Pull and junction boxes installed within the cavity of a suspended ceiling that is not a fire rated assembly may be attached to the suspended ceiling framing members, provided the following criteria are met:
   1. Installation complies with the ceiling system manufacturer's instructions.
   2. Pull or junction box is not larger than 100 cubic inches.
   3. The pull or junction box is supported to the main runner with two fastening devices that are designed for framing member application and positively attach or lock to the member.
   4. The pull or junction box serves branch circuits and associated equipment in the area.
   5. The pull or junction box is within 6 feet of the luminaires supplied.
   6. The framing members are not rotated more than 2 degrees after installation.

B. Pull and junction boxes installed within the cavity of a suspended ceiling may be attached to independent support wires, provided the following criteria are met:
   1. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.
   2. Pull or junction box is not larger than 100 cubic inches.
   3. The pull or junction box is secured to the independent support wires by two fastening devices that are designed for the application.
   4. Independent support wires in a fire-rated ceiling are distinguishable by color, tagging or other effective means.

3.03 CABLES AND RACEWAY

A. Cables and raceway installed within the cavity of a suspended ceiling may be attached to independent support wires provided the following criteria are met:
   1. Independent support wires are taut and connected at both ends, one end to the ceiling framing member and the other to the structure above.

2. Raceways are not larger than one inch trade size and cables and bundled cables are not larger than one inch diameter including insulation.
3. Not more than three raceways or cables are supported by any independent support wire and are supported within the top or bottom 12 inches.
4. Cables for telecommunications, data processing, Class 2 power-limited signaling systems, fiber optics, and other power limited systems are securely fastened within 2 feet of each termination and at intervals not to exceed 5 feet or per the manufacturer's installation instructions.
5. Raceways are secured at intervals required for the type of raceway installed.
6. Cables and raceway are secured to independent support wires by fastening devices and clips designed for the purpose.
7. Independent support wires are distinguishable by color, tagging, or other effective means.

B. Cables and raceway installed within the cavity of a suspended ceiling may be supported with trapezes constructed of steel rods and channels provided the following criteria are met:
1. The size of the rods, channel, and fastening devices are suitable for the anticipated weight.
2. The spacing of the trapezes meets that required for the type of raceway installed.
3. Cables and raceway are secured to a trapeze by straps designed for the purpose.
4. Cables and raceway do not support other raceway or cables.
5. An appropriately sized seismic bracing system is installed.

END OF SECTION **260529**

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes raceways, conduits, and boxes for electrical systems wiring, including all fittings, hangers, and appurtenances.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 260526, Grounding and Bonding for Electrical Systems

B. Section 260536, Cable Trays for Electrical Systems

C. Section 260543, Underground Ducts and Raceways for Electrical Systems

D. Section 260553, Identification for Electrical Systems

E. Section 262726, Wiring Devices

1.03 REFERENCES

A. ANSI: American National Standards Institute:
   1. ANSI C80.1: Electrical Rigid Steel Conduit
   2. ANSI C80.3: Steel Electrical Metallic Tubing
   3. ANSI C80.4: Fittings for Rigid Metal Conduit and Electrical Meta

B. ASTM: American Society for Testing Materials:
   1. ASTM A193: Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
   2. ASTM E814: Standard Test Method for Fire Tests of Penetration Firestop Systems

C. JIC: Joint Industrial Council
   1. JIC EMP-1: Electrical

D. NEC: National Electrical Code:

E. NEMA: National Electrical Manufacturers Association.
   1. NEMA RN 1: Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
   2. NEMA TC2: Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
   3. NEMA Product and Installation Standards.

F. NFPA: National Fire Protection Association:
   1. NFPA 70: National Electrical Code

G. TIA: Telecommunications Industry Association/Electronic Industries Association
   1. TIA 569-A: Commercial Building Standard for Telecommunications Pathways and Spaces

H. UL: Underwriters Laboratories:
   1. UL 360: Standard for Liquid-Tight Flexible Metal Conduit
   2. UL 651: Rigid Nonmetallic Electrical Conduit
   3. UL 651A: High-Density Polyethylene Conduit
   4. UL 1479: Intermediate Metal Conduit.

1.04 DEFINITIONS

A. "Where subject to physical damage," is defined as a surface installation within an 8-foot zone above a finished floor, in areas subject to vehicular traffic, including manually operated fork lifts.

1.05 SUBMITTALS

A. Submittals for the following materials shall consist only of a listing of the manufacturer's name and the applicable catalog numbers of the items to be utilized. Upon review of this list, further information may be requested.
   1. Conduit.
   2. Conduit fittings.
   3. Supports.

B. Submittals for the following materials shall be complete with detailed information and cut sheets.
   1. Wireway and wire gutters.

C. Provide as-constructed drawing information identifying final conduit routing and box locations upon completion of the work.

1.06 QUALITY ASSURANCE

A. Products shall be new and certified by an approved testing laboratory.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials shall be of current standard design and shall conform to the established standards of an approved testing laboratory. Like items shall be of the same manufacturer and type.

2.02 METALLIC CONDUITS

A. Galvanized Rigid Steel Conduit (GRSC):
   1. Heavy wall construction, manufactured in conformance with ANSI C80.1 and listed as UL 6 approved.

B. Electrical Metallic Tubing (EMT):
   1. Thin wall electrogalvanized steel, manufactured in conformance with ANSI C80.3 and listed as UL 797 approved.

C. PVC Coated Rigid Steel Conduit and Fittings:
   1. ANSI C80.1 hot-dipped galvanized rigid steel conduit with an external 0.040" minimum PVC protective coating per NEMA Standard RN 1. Both ends of conduit shall be threaded with thread protectors, factory-installed. Fittings shall be threaded type ANSI C80.4, hot-dipped galvanized, with a 0.055" minimum PVC protective coating. PVC coating on fittings shall match the coating on the PVC coated conduit.

D. Flexible Metal Conduit:
   1. Manufactured from hot dipped galvanized steel manufactured in conformance with UL standards. Flexible metal conduit shall be a minimum of 1/2-inch standard trade size.

E. Liquid-Tight, Flexible Metal Conduit:
   1. Conduit shall have a ground wire.
   2. Aluminum or galvanized flexible metal conduit shall have a polyvinylchloride chemical resistant jacket in conformance with the requirements of UL 360. Acceptable manufacturers are Sealtight, or equal.

F. Explosion-Proof Flexible Conduit:
   1. Watertight flexible conduit shall be suitable for use in Class I, Division 1, Group D hazardous areas as specified in NFPA No. 70.

2.03 RIGID NON-METALLIC CONDUITS

A. Polyvinylchloride (PVC) Conduit:
   1. PVC conduit shall be Type II, in conformance with NEMA TC2 and the following:
      a. Schedule 40, high impact.
      b. Suitable for use with 90ºC rated wire.
      c. Conform to UL Standard 65l and carry appropriate UL listing for above and below ground use.

B. High-Density Polyethylene (HDPE) Conduit:
   1. HDPE conduit shall be the following:
      a. Schedule 40, high impact.
      b. Suitable for use with 90ºC rated wire.
      c. Conform to UL Standard 651A and have appropriate UL listing for below-ground use.

2.04 METALLIC BOXES

A. Flush and Concealed Outlet Boxes:
   1. Galvanized stamped steel with screw ears for device ring mounting, knock-out plugs, mounting holes, and fixture studs if required. Acceptable manufacturers are RACO, or equal.

B. Surface Outlet Boxes (Interior Locations):
   1. Boxes for use on ceilings shall be galvanized stamped steel with screw ears for device ring mounting, knock-out plugs, mounting holes, and fixture studs if required. Acceptable manufacturers are RACO, or equal.
   2. Boxes for use on walls below 8 feet or where noted on drawings shall be cast steel or aluminum with threaded hubs.

C. Large Boxes:
   1. When required, boxes exceeding 4 11/16 inches square shall be welded steel construction with screw cover and painted, steel gauge matching physical size. Acceptable manufacturers are Hoffman, Circle AW, or equal.

D. Floor Boxes:
   1. Boxes in concrete floors shall be adjustable flush power floor boxes with aluminum duplex service tops. Acceptable manufacturers are Hubbell 825 29/SA 3925, or equal.
   2. Boxes on flush ducts shall have service fittings as required. Equip outlets with receptacles as specified in Section 262726. Acceptable manufacturers are Hubbell SC-3900 series, or equal.

2.05 BOXES AND FITTINGS

A. Sheet Metal Boxes and Fittings:
   1. Boxes and fittings installed in areas where electrical metallic tubing is specified shall be standard UL-approved sheet steel type.

B. Cast Ferrous Alloy Boxes (Outside Locations):
   1. Hot-dipped galvanized cast ferrous alloy unless otherwise specified.
   2. Conduit entrances shall be integrally cast threaded hubs or bosses and shall provide for full 5-threaded contact on tightening. Drilling and treading shall be done before galvanizing.
   3. Device covers shall be suitable for boxes, with full-body neoprene gaskets to fit the devices and boxes used.
   4. Cover plates shall be hot-dipped galvanized cast ferrous alloy unless the particular device requires a cover that is not manufactured in this material.
   5. Type 304 stainless steel screws shall be provided for covers.
   6. Where two or more devices are located together, outlet and device boxes shall be gang type.
   7. Device boxes shall be FD boxes as manufactured by Crouse-Hinds, Appleton, or equal.

C. Steel Sheet Boxes (Outside Locations):
   1. Boxes larger than Type FD shall be fabricated from steel plating and shall be hot-dipped galvanized. The thickness of the steel plating shall conform to the requirements of JIC. Before finish galvanizing, furnish and install a grounding pad drilled for two-bolted grounding lugs or with a grounding stud welded to the inside of the box.
   2. Provide 316 stainless steel hardware.
   3. Boxes shall, as a minimum, meet NEMA 12 and JIC requirements and shall be NEMA 4 where exposed to weather or water.
   4. Galvanized sheet steel boxes may be used in protected areas where electrical metallic tubing is specified. Boxes shall be a minimum of 4 inches square.

2.06 CONDUIT FITTINGS

A. GRSC:
   1. Fittings, including couplings, shall be threaded unless otherwise approved by the Owner.
   2. Threadless Couplings and Connectors:
      a. GRSC couplings and box connectors may be steel threadless, compression ring, or set screw type for use with conduits 1 inch and smaller installed in poured concrete locations where limited working space makes threaded fittings impractical.
      b. Threadless fittings are not acceptable for use with GRSC conduits except as allowed above. They may, however, be used with EMT type conduits.
   3. Myers hubs or equal shall be used with NEMA 2, 3, 3R, 4 and 12 enclosures.
   4. Threaded Locknuts:
      a. Sealing type may be used with NEMA 2, 3, 3R, 4 and 12 enclosures at bottom penetrations.
      b. Extra-heavy electrogalvanized steel for sizes up to 2 inches. Locknuts larger than 2 inches shall be electrogalvanized malleable iron.
   5. Threaded Bushings:
      a. 1 1/4 inch and larger, insulated, grounding type as required in Section 260526.
      b. Electrogalvanized malleable iron with insulating collar.

c. Locking type and provided with a feed-through compression lug for securing the ground cables.

6. Unions shall be electrogalvanized ferrous alloy type. Acceptable manufacturers are Appleton, UNF or UNY; Crouse-Hinds, UNF or UNY; or equal.
7. Conduit bodies shall be ferrous alloy type (malleable iron), with clamp type fastening covers.
8. Gaskets shall be neoprene.

B. EMT:
1. EMT couplings and connectors shall be watertight compression type or set screw type with steel bodies, zinc or cadmium coated. Die cast fittings will not be permitted.
2. Connectors shall be steel compression ring or set screw type for conduit termination, with insulated throat, suitable for the application.
3. Couplings shall be steel compression ring or set screw type.

C. Flexible Metal Conduit:
1. Fittings shall be 2-screw steel body type, zinc, or cadmium coated. Die cast fittings will not be permitted.

D. Liquid-Tight, Flexible Metal Conduit:
1. Fittings for liquid-tight conduit shall have a cadmium-plated malleable iron body and gland nut with cast-in lug, brass grounding ferrule, threaded to engage conduit spiral and o-ring seals around the conduit and box connection and insulated throat. Use 45-degree and 90-degree fittings where necessary.
2. Fittings shall be threaded and compression type for polyvinyl jacketed flex.

E. Weatherproof Connectors:
1. Provide threaded connectors.

F. Expansion Couplings:
1. Provide O.Z. type EX couplings with jumper. Gedney, or equal.

G. Seal-Offs:
1. Provide seal-offs with filler fiber, compound, and removable cover.

H. HDPE Conduit:
1. HDPE couplings and connectors shall be UL listed and specifically designed for HDPE applications.
2. HDPE connectors and joints shall be made by a method approved by the Owner. PVC glue is not permitted on HDPE.

2.07 RACEWAY SUPPORTS

A. Conduit Supports:
1. Hot-dipped galvanized (exterior) or electrogalvanized (interior) steel framing channel to support groups of conduit.
2. Use one-hole galvanized malleable iron pipe straps with galvanized clamp backs and nesting backs where required.
3. Use one-hole galvanized steel pipe straps on studs for interior applications.
4. Supports for PVC coated rigid steel shall be PVC coated straps, struts, or hangers.

B. Ceiling Hangers:
   1. Adjustable galvanized carbon steel rod hangers in conformance with ASTM A193. Rods shall be minimum 1/2 inch in diameter, threaded continuously.
   2. Use stainless steel hanger rods where rods will be located in corrosive areas and exposed to the effects of weather or moisture.
   3. Steel support wire hangers with fastening devices and clips designed as applicable to the work.

C. Structural Attachments (Racks):
   1. Hot-dipped galvanized steel framing channel.
   2. Treat field cuts with zinc-enriched paint.

2.08 MISCELLANEOUS PRODUCTS

A. Provide watertight seals at penetrations though exterior walls or walls exposed to moisture. Acceptable manufacturers are type CSMC by O.Z. Gedney Co., Link Seal by Thunderline Corp., or equal.

B. Provide waterproof firestops and seals in specified locations. Acceptable manufacturers are Flamemastic 71A, Vimasco No. 1-A, or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:
   1. Existing boxes and raceways, exposed under this contract, shall be properly supported per NEC before cover approval.
   2. All conduit and wireway installations shall comply with NEMA, “Standards of Installation.”
   3. Cutting or notching shall be kept to a minimum, using only approved methods. Structural members shall not be disturbed or cut in any way without specific written approval from the Owner, on a case-by-case basis. Patch and correct finished surfaces damaged by electrical work. Fire barriers shall be returned to their original condition using materials of equal or higher fire rating and specifically designed for that use.
   4. Unless otherwise noted on the drawings, all conduit work in finished spaces shall be concealed. Exposed conduit is acceptable only when and where prior specific authorization for use is obtained from the Owner.
   5. Conceal all conduits in finished spaces and elsewhere so far as practicable. Concealed conduits shall run in a direct line with long sweep bends and offsets. Where conduit runs between junction boxes and/or devices, route conduit vertically below ceiling level. Where horizontal runs are required, route above ceiling level for future flexibility.
   6. Route exposed conduit parallel or at right angles to structural building lines and neatly offset into boxes. Conduits attached directly to building surfaces shall closely follow the surfaces. Conduit fittings may be used to “saddle” under beams.
   7. Route conduit in existing racks whenever possible.
   8. Cut conduits square, ream smooth, and draw fittings up tight with at least five threads fully engaged.

9. Conduits, whether exposed or concealed, shall be securely supported and fastened at minimum intervals of 6 feet and within 18 inches of each outlet, elbow, fitting, panel, etc. Support suspended conduits with metal ring or trapeze hangers on threaded, steel rods having a safety factor of four.
10. During construction, keep conduit and raceways closed with suitable plugs or caps to prevent entrance of dirt, moisture, concrete, or foreign objects. Raceways shall be clean and dry before installation of wire and at the time of acceptance.
11. Pack spaces around conduits with oakum and seal to prevent entrance of moisture where conduits are installed in sleeves or block-outs which penetrate moisture barriers.
12. Install intumescent material around ducts, conduits, etc. to prevent spread of smoke or fire where installed in sleeves or block-outs which penetrate rated fire barriers. The penetration sealing system shall be capable of passing a 3-hour test per ASTM E814 (UL 1479) and shall consist of a material capable of expanding when exposed to temperatures of 250-350ºF. An alternate method utilizing intumescent materials in caulk and/or putty form may be used.
13. Provide GRSC on underground conduit runs at 60-degree and larger bends, and where conduits exit concrete.
14. Underground stub-ups shall use wrapped or PVC coated rigid steel galvanized 90-degree elbows with a minimum radius not less than that permitted by code, or as noted on the drawings. Conduit risers from these elbows shall be wrapped or PVC coated rigid steel galvanized conduit. Extend GRSC 18 inches beyond penetrations.
15. Existing raceways exposed under this contract shall be properly supported per NEC before cover approval.

B. Conduit Runs Between Pull Boxes:
1. Limit the number of directional changes of the conduit to a maximum total of 270 degrees in any run between pull boxes.
2. Limit the number of directional changes of the conduit to a maximum of 180 degrees in any run between pull boxes for communications conduits, unless otherwise approved by the Owner.
3. Limit conduit runs to 400 feet, less 100 feet for each 90 degrees of change in direction.
4. Avoid bends and offsets whenever possible. However, when bends and offsets are necessary they shall be factory bends or bends made with a hickey or conduit bending machine. Heating, welding, or brazing the conduit for bends is not acceptable.

C. Junction and Pull Boxes:
1. Where required for pulling cable and as necessary to meet NFPA No. 70, provide cast junction boxes or pull boxes. Pull boxes used for multiple conduit runs shall not combine circuits fed from different MCC's, switchboards, or switchgear.

D. Conduit Terminations:
1. Conduit entering sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating grounding or bonding bushing constructed over the conduit end.
2. Conduit entering top or sides of NEMA 3R, 4, and 12 boxes shall be terminated with a rain-tight hub having an insulated liner.
3. Surface-mounted cast boxes and plastic enclosures shall have threaded hubs.
4. Joints shall be made with standard couplings or specified unions.

5. Metal parts of plastic or coated control stations and coated boxes shall be bonded to the conduit system.
6. Running threads shall not be used in lieu of nipples, nor shall excessive thread be used on any conduit.
7. The ends of conduit shall be cut square, reamed, and threaded with straight threads.
8. Male threads on rigid steel conduit shall be coated with electrically conductive, zinc rich paint.
9. Steel conduit shall be made up-tight, with thread compound.

E. Conduit Support:
1. Exposed metallic conduit shall be run on supports spaced not more than 6 feet apart unless noted otherwise on the drawings and shall be constructed with runs parallel or perpendicular to walls, structural members or intersections of vertical planes and ceiling.
2. Exposed PVC conduit shall be run on supports spaced not more than 3 feet apart for conduits up to 1 inch, 5 feet apart for conduits 1 1/4 inches to 2 inches, and 6 feet apart for conduits 2 1/2 inches and larger.
3. No conduit shall approach closer than 6 inches to any object which operates above the rated temperature of the cable insulation it contains.
4. Conduit, except PVC, supported directly from the concrete structure shall be spaced at least 1/4 inch using one-hole, hot-dipped galvanized, malleable iron straps with nesting backs or, if three or more conduits are located in parallel run, they may be spaced from the wall approximately 5/8 inch to 1 inch by means of framing channel.
5. Runs of individual conduit suspended from the ceiling shall be supported with galvanized carbon steel rod hangers. Where three or more conduits are suspended from the ceiling, steel racks shall be constructed.
6. PVC conduit supported directly from the concrete structure shall be spaced out at least 1/4 inch using PVC conduit wall hangers.
7. Conduit rack and tray supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors, die-cast rust-proof expansion shields, or cast flush anchors. Wooden plugs, plastic inserts or gunpowder-driven inserts are not acceptable as a base to secure conduit supports.
8. Runs of individual conduit suspended from the ceiling shall be supported with galvanized carbon steel rod hangers or wire hangers. Where three or more conduits are suspended from the ceiling, steel racks shall be constructed.

F. Conduit Penetrations:
1. Conduit routed through floors, walls, or other concrete structures shall pass through cast-in-place openings wherever possible. In cases where cast-in-place openings are not possible, use appropriately sized holes which will not impair the structure's integrity. After completion, grout and caulk surface to be watertight and refinish to match existing surroundings.
2. Install watertight seals wherever conduits penetrate concrete wall panels or walls to the outdoors.
3. Install firestops and seals at penetrations through building floors, walls, or where required by fire codes.
4. Provide waterproof firestops and seals in specified locations.

G. Raceway Separation:
   1. Whenever possible, separate signal raceways from AC power or control raceways a minimum of 12 inches.

H. Expansion Joints and Expansion Couplings:
   1. At expansion joint crossings and where noted on the drawings, verify maximum design deflection. Use expansion coupling fittings. At crossings of expansion joints with 1 1/2-inch conduit and smaller, flex conduit may be used where acceptable.

I. Liquid-Tight, Flexible Metal Conduit:
   1. Use liquid-tight in accordance with JIC standards and the following:
      a. Where specified or indicated on the drawings.
      b. Where flexibility is required for electrical raceways on equipment.
      c. For motor mounts.
   2. The maximum length of conduit shall be 24 inches for conduits 1 1/2 inches or smaller and 36 inches for conduits 2 inches or larger. The terminating fittings and sealing shall be as specified.

J. Non-Metallic Conduit:
   1. Elbows, offsets, or 60-degree and larger bends in direct buried or concrete embedded conduit runs shall be galvanized rigid steel. The final length of conduit runs which rise up through concrete slabs or curbs shall be galvanized rigid steel, provided with grounding bushing.
   2. Make connections with waterproof solvent cement.
   3. PVC conduit entering fiberglass boxes or cabinets shall be secured by threaded bushings on the interior of the device and shall be terminated with a threaded male terminal adapter having a neoprene O-ring. Joints shall be made with standard couplings.

K. Galvanized Rigid Steel Conduit (GRSC):
   1. GRSC embedded in concrete below grade or in damp locations shall be made watertight by painting the entire male thread with metal primer paint before assembly.

3.02 INSTALLATION OF RACEWAYS AND BOXES FOR FIRE ALARM.

A. Fire alarm conduit and boxes installed in concealed locations or located in stairwells, storage rooms, electrical rooms, mechanical rooms, and utility rooms shall be factory-painted red.

B. Exposed fire alarm conduits in finished spaces shall be painted to match adjacent wall and ceiling finishes.

3.03 BOXES

A. Installation:
   1. Mount boxes and outlets at center line, at heights shown on the drawings.
   2. Install outlet boxes, sized by code, large enough to accommodate all wires, fittings, and devices.
   3. Install multi-gang boxes as required to accept devices with no more than one device per gang.
   4. Equip all metallic boxes with grounding provisions.

5. Flush wall switch, and receptacle outlets used with conduit systems shall be a minimum of 4 inches square, 1 1/2 inches or more deep, with a one- or two-gang plaster ring mounted vertically. Where three or more devices are at one location, use a one-piece multiple gang tile box or a gang box with a suitable device ring.
6. Wall bracket and ceiling, surface-mounted lighting fixture outlets shall be a minimum of 4 inches square and 1 1/2 inches deep with a 3/8-inch fixture stud where required. Wall bracket outlets shall have a single-gang opening where required to accommodate fixture canopy. Provide larger boxes or extension rings where the quantity of wires installed requires more cubic capacity.
7. Boxes for communication systems shall be a minimum of 4 11/16 inches square and 3 1/2 inches deep. Provide communication outlet boxes with a one-gang plaster ring mounted vertically.
8. Boxes for special systems shall be suitable for the equipment installed. Coordinate size and type with the system supplier.
9. Install pull boxes where shown on the drawings or required by code. Use galvanized boxes of the size required by code with removable covers installed so that covers will be accessible after work is completed.
10. Install boxes flush with finished surfaces or not more than 1/8-inch back and install boxes level and plumb. Long screws with spacers or shims for mounting devices are not acceptable. Do not expose combustible materials to wiring at outlets.
11. Extend covers for flush mounted boxes in finished spaces a minimum of 1/4-inch beyond the box edge to provide a finished appearance. Finish edge of cover to match cover face.
12. Mount cast boxes or plaster trims for weatherproof outlets horizontally.

3.04 CONDUIT TYPE REQUIREMENTS

A. PVC Coated Rigid Steel Conduit. Uses permitted:
   1. Embedded or encased in concrete.
   2. Underground.

B. Electrical Metallic Tubing (EMT). Uses permitted:
   1. In dry, protected locations.
   2. Exposed at a height more than 8 feet above floor level, or more than 18 inches above floor level in HVAC equipment rooms, utility tunnels, communication equipment rooms, electrical rooms, or unoccupied spaces, unless otherwise noted on the drawings.

C. Flexible Metal Conduit.
   1. Use where flexibility is necessary, as at motors, transformers, recessed light fixtures, etc. Flexible conduit terminations at motors, transformers, etc., shall be limited to 18 inches. Use flexible conduit for other purposes only after obtaining Owner approval.

D. Polyvinylchloride Conduit (PVC), Schedule 40. Uses permitted:
   1. Embedded or encased in concrete (use GRSC where conduits exit concrete work).
   2. Direct-buried 18 inches or more below grade.

3.05 RACEWAY AND CONDUIT SIZES

A. As shown in the equipment schedule

3.06 FITTINGS

A. Assemble metallic raceways and conduits in one continuous piece and secure to boxes, panels, etc. with appropriate fittings to maintain electrical continuity. All conduit joints shall be cut square and reamed smooth with all fittings drawn up tight.

3.07 PULL LINES

A. Install nylon pull lines in all empty conduits where routing includes 25 feet or more in length or includes 180 degrees or more in bends.

B. Where conduits requiring pull lines are stubbed out and capped, coil a minimum of 36 inches of pull line and tape at termination of conduit for easy future access. Label pull lines as to conduit starting or termination point or intended future use.

END OF SECTION **260533**

SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. Clearly and properly identify the complete electrical system to indicate the loads served or the function of each item of equipment connected under this work.

1.02 REFERENCES

A. ANSI: American National Standards Institute
   1. ANSI Z535.4: Product Safety Signs and Labels

B. NEC: National Electric Code
   1. NEC Article 110: Requirements for Electrical Installation

C. OSHA: Occupational Safety and Health Administration

PART 2 PRODUCTS

2.01 LABELS

A. Pre-Printed: Permanent material pre-printed with black on white, with adhesive backing. Brady, 3M, or equal.

B. Laminated Plastic: 3-ply laminated plastic, color as indicated, with 1/2-inch high white letters for low voltage and 1-inch high white letters for high voltage. Lamicoid, or equal.

C. Plastic Tape: Black or red with white letters, adhesive backing, field-printed with proper tool. Dymo-tape, or equal.

D. Marker Tape: Clear adhesive-backed tape with black letters, for device plates. Kroy, or equal.

E. Wire Markers: White with black numbers, adhesive-backed tape on dispenser roll. Brady, 3M, or equal.

F. Marker Pen: Black permanent marker suitable for writing on metallic surfaces.

G. Clearance Warning Tape: 2-inch wide self-adhesive vinyl type, black/yellow stripes. Seton, Brady, or equal.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Use laminated labels at all interior and protected locations. Use professionally engraved, white enamel filled brass labels in all areas exposed to the weather and/or sunlight, and in environment air handling spaces.

B. Install conduit and innerduct labels at each end of the conduit run, at entrances of all duct banks, distribution panels, motor control centers, panel boards, etc. Provide a minimum of one label per room or space.

C. Install equipment labels with stainless steel #4 screws.

D. Label cables with preprinted label. Labels shall wrap around and shall have a reference number. At a minimum, label the cable at the cable start and end terminals, at intermediate points in runs where cable leaves a cable tray, and at all intermediate junction boxes and lay down locations.

E. Complete installation of labels prior to ceiling installation.

3.02 LOW VOLTAGE SWITCHGEAR

A. Label all low voltage switchboards and protective devices with laminated plastic labels indicating the function or the load served.

B. Provide laminated plastic labels for all bussed spaces indicating the maximum ampere rating or size of future breaker or switch that may be installed in the space reserved.

3.03 BRANCH CIRCUIT PANELBOARDS

A. Indicate panel number, source, and if applicable, transformer number from which the panel is fed with laminated plastic labels attached to face trim.

B. Provide typewritten or power system software generated panel directories, with protective, clear transparent covers, accurately accounting for every breaker installed, including spares. Schedules shall use the actual loads and room designations assigned by name or number near completion of the work. Do not use the designations from the drawings.

3.04 EQUIPMENT

A. Label all disconnect switches, individual circuit breakers, security and communications panels, relays, contactors, time switches, and indicating equipment with laminated plastic labels indicating equipment number, source, and circuit number.

B. Where the controlling device is remote-mounted from the serving panel, include the serving panel designation and circuit number with additional plastic tape labels.

3.05 DEVICES

A. All receptacle plates shall be marked in black permanent marker tape on the face of the plate, with the receptacles panel and branch circuit designation. The identification shall be made with clear self-adhesive tape with black 10-point letters. Apply the tape at the top of the device plate.

B. Receptacles specified or noted on the drawings to be engraved, shall have the circuit information engraved in 3/16-inch letters on the front face of the plates. The alphabetic and numeric marking shall be made on the inside of the plate.

C. Receptacles connected to a GFCI-protected circuit downstream from the protecting device shall be labeled “GFCI Protected.”

3.06 CONDUIT AND CABLE

A. Label all conduit runs and open cable wiring routed in cable tray or accessible ceiling spaces. Attach labels at the end of the conduit run and at least one per room. Place at entrances of all distribution panels, MCC, panelboards, etc.

B. Label all conduit runs and open cable wiring routed in cable tray or accessible ceiling spaces. Space labels a maximum of 50 feet apart and at least one per room. Place at entrances of all "J" boxes, distribution panels, panelboards, etc.

C. Use laminated plastic labels as shown in the [drawings] [attached labeling detail].

D. Complete installation of labels prior to ceiling installation.

3.07 OUTLET, PULL, AND JUNCTION BOXES

A. Paint fire alarm and security access system outlets, pull, and junction boxes in accordance with the directions of their specific sections.

B. Label all pull boxes and junction boxes for fire alarm, security, surveillance, and communications systems with plastic tape, red with white letters. Where boxes are recessed in finished areas, mount label on inside of cover.

C. Label power junction boxes neatly by hand, indicating source and circuit number.

END OF SECTION **260553**

SECTION 262726 – WIRING DEVICES

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes wiring devices, plates, and blank plates for outlet boxes.

1.02 SUBMITTALS

A. Submit product data, shop drawings, and samples.

PART 2 PRODUCTS

2.01 GENERAL

A. Wiring devices shall be specification grade, with special devices as noted on the drawings. Should the drawings indicate a device other than those listed herein without reference to catalog number, such device shall be of the same grade and manufacturer as specified below. Furnish a matching cap for all special purpose devices that do not have the common 120V NEMA 5-20R configuration.

2.02 RECEPTACLES

A. Acceptable Manufacturers: Arrow-Hart, Bryant, Eagle, General Electric, Hubbell, Leviton, Pass & Seymour, Sylvania, or equal.

B. General Application Duplex: 3-wire, 2-pole grounding, NEMA 5-20R, grey nylon exposed finish, back and side wired, Hubbell 5362 series.

C. Ground Fault Interrupting Duplex: Feed through, NEMA 5-20R, grey nylon exposed finish, Hubbell GF-5362 series.

D. Special Purpose Receptacles: As noted on the drawings. Provide with NEMA configurations.

2.03 PLATES

A. Receptacle Weatherproof: Gasketed cast aluminum, double lift, cover mounted horizontally with hinges up, 3-1/4-inch internal depth, lockable. UL listed for wet locations with cord plug inserted. Red Dot Code Keeper Extra-Duty While-in-Use Cover series, or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Devices and finish plates shall be installed plumb with building lines. Wall-mounted receptacles shall be installed vertically at the centerline height shown on the drawings.

B. Install finish plates and devices after final painting is complete. Scratched or splattered finish plates and devices will not be accepted.

C. Special plugs, such as cord caps furnished with the receptacles, shall be furnished in their cartons.

3.02 COORDINATION

A. The drawings indicate the approximate location of all devices. Refer to architectural elevations, sections, and details for exact locations.

B. Work with the equipment installer to coordinate the locations and methods of connection to devices mounted in or near cabinets, counters, benches and similar equipment.

3.03 FIELD TESTING

A. Receptacles shall be tested for line-to-neutral, line-to-ground and neutral-to-ground faults. Correct any defective wiring.

END OF SECTION **262726**

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide switches as indicated on the drawings, in the specifications and where required by the National Electrical Code, even though not indicated. Provide fused or non-fused switches as shown on the drawings and as required by equipment manufacturer or circuit requirements.

B. This section describes the following individually mounted, enclosed switches and circuit breakers:
   1. Nonfusible switches.
   2. Low-voltage and current-limiting fuses

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 260529, Hangers and Supports for Electrical Systems

B. Section 260553, Identification for Electrical Systems

1.03 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. HD: Heavy duty.

C. RMS: Root mean square.

D. SPDT: Single pole, double throw.

1.04 REFERENCES

A. CFR: Code of Federal Regulations
   1. 29 CFR 1910.7: Definition and Requirements for a Nationally Recognized Testing Laboratory

B. NEC: National Electric Code

C. NECA: National Electrical Contractors Association
   1. NECA 1: Standard Practice of Good Workmanship in Electrical Construction

D. NEMA: National Electrical Manufacturers Association
   1. NEMA FU 1: Low-Voltage Cartridge Fuses
   2. NEMA PB 1.1: General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 V or Less
   3. NEMA PB 2.1: General Instructions for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 600 V or Less

E. NETA: International Electrical Testing Association
   1. NETA ATS: Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

F. NFPA: National Fire Protection Association
   1. NFPA 70: National Electric Code

G. OR-OSHA: Oregon Occupational Safety and Health Administration

H. UL: Underwriters Laboratories
   1. UL 198C: Standard for Safety for High-Interrupting-Capacity Fuses, Current-Limiting Types
   2. UL 198D: Class K Fuses
   3. UL 198E: Class R Fuses
   4. UL 198H: Class T Fuses

1.05 SUBMITTALS

A. Product Data: Submit for each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current rating.
   4. UL listing for series rating of installed devices.
   5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Field quality-control test reports including the following:
   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.

C. Operation and Maintenance Data: Include data for enclosed switches and circuit breakers in operation and maintenance manuals. In addition to items specified in Division 01, include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OR-OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
   1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. 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.

C. Comply with NFPA 70.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

PART 2 PRODUCTS

2.01 FUSIBLE AND NON-FUSIBLE SWITCHES

A. Acceptable Manufacturers:
   1. General Electric Co., Electrical Distribution & Control Division.
   2. Siemens Energy & Automation, Inc.
   3. Square D/Group Schneider.
   4. Eaton Cutler-Hammer.
   5. Pre-bid approved equal.

B. Nonfusible Switch: NEMA KS 1, Type HD, quick-make, quick-break, dual-rated with electrical characteristics as required by the system voltage and the load served. Include lockable handle with capability to accept two padlocks and interlocked with cover in closed position.

2.02 LOW-VOLTAGE AND CURRENT-LIMITING FUSES

A. Conform to NEMA FU 1. Time delay and non-time delay options shall be as shown on the drawings.

B. Provide equipment with a complete set of properly rated fuses when the equipment manufacturer utilizes fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed.

C. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage and shall have the time-current characteristics required for effective power system coordination.

D. Cartridge Fuses: Cartridge fuses, current-limiting type, Class [G] [J] [K] [L] [RK1] [RK5] [RK9] [T] [CC] shall have tested interrupting capacity not less than [100,000] [200,000] amperes. Fuse holders shall be the type that will reject Class H fuses.
   1. Class [G] [J] [L] [CC] fuses shall conform to UL 198C.
   2. Class K fuses shall conform to UL 198D.
   3. Class R fuses shall conform to UL 198E.
   4. Class T fuses shall conform to UL 198H.

E. Transformer Circuit Fuses: Transformer circuit fuses shall be Class RK1 or RK5, current-limiting, time-delay with 200,000 amperes interrupting capacity.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Section 260529.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 260553.

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Section 260533.

3.04 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:
   1. Inspect mechanical and electrical connections.
   2. Verify switch and relay type and labeling verification.
   3. Verify rating of installed fuses.
   4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

B. Perform the following field tests and inspections and prepare test reports:
   1. Test mounting and anchorage devices according to requirements in Section 260529.
   2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
   3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   4. Infrared Scanning:
      a. Initial Infrared Scanning: After substantial completion, but not more than 60 days after final acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.

3.05 CLEANING

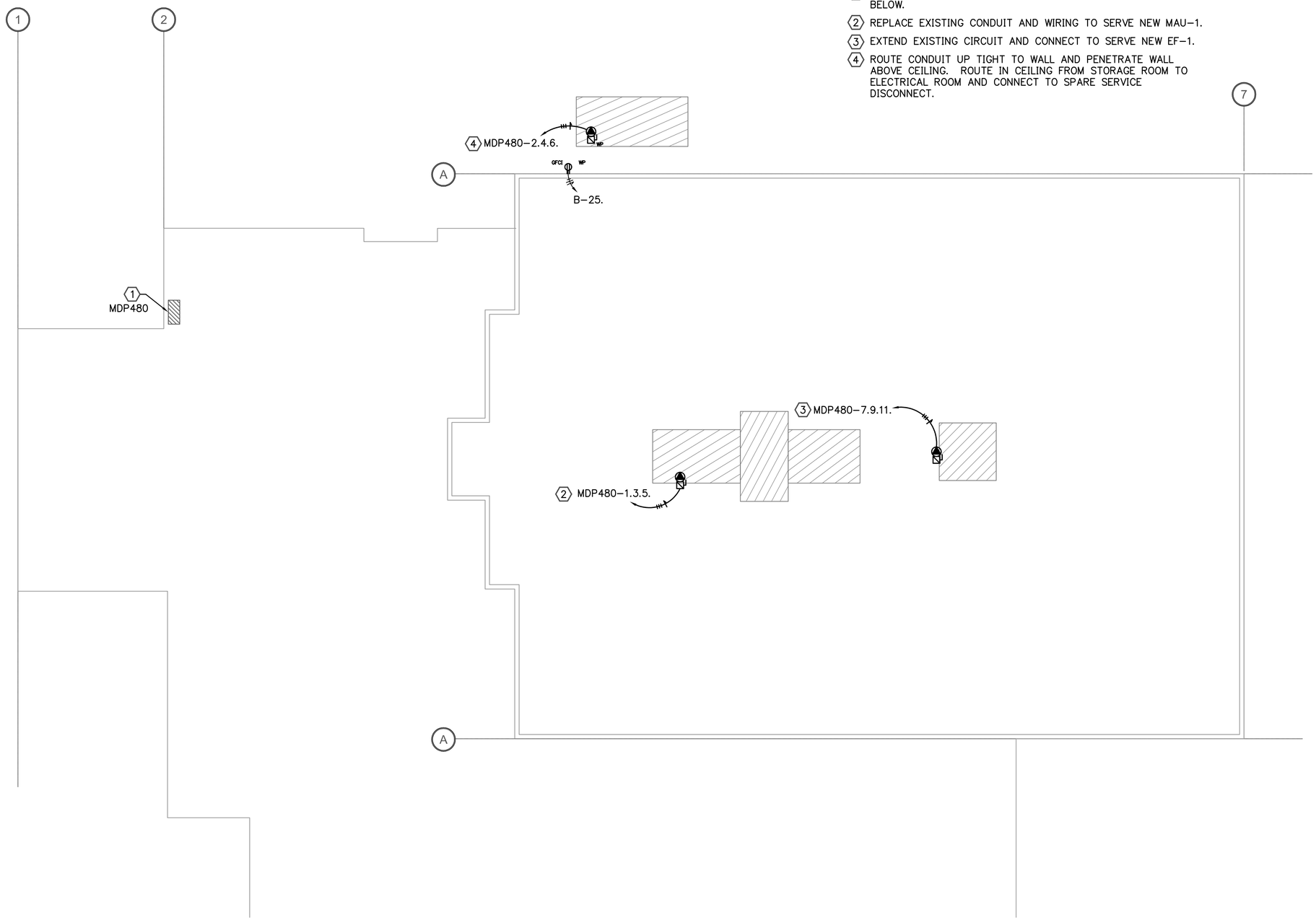
A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION **262816**

NOTES THIS SHEET:

1. 480VOLT, 3-PHASE, 4-WIRE MDP LOCATED IN ELECTRICAL ROOM BELOW.
2. REPLACE EXISTING CONDUIT AND WIRING TO SERVE NEW MAU-1.
3. EXTEND EXISTING CIRCUIT AND CONNECT TO SERVE NEW EF-1.
4. ROUTE CONDUIT UP TIGHT TO WALL AND PENETRATE WALL ABOVE CEILING. ROUTE IN CEILING FROM STORAGE ROOM TO ELECTRICAL ROOM AND CONNECT TO SPARE SERVICE DISCONNECT.



1 M201 ROOF PLAN - ELECTRICAL

SCALE: 0 8 16

SCALE IN FEET

NORTH

REV	DESCRIPTION	DATE
0	ISSUE FOR CONSTRUCTION	2022-03-02

OWNER:
CLACKAMAS COUNTY PSTC
12700 SE 82ND AVE, CLACKAMAS, OR 97015

SHEET TITLE: ROOF PLAN - ELECTRICAL

PROJECT NAME: FIRING RANGE HVAC REPLACEMENT

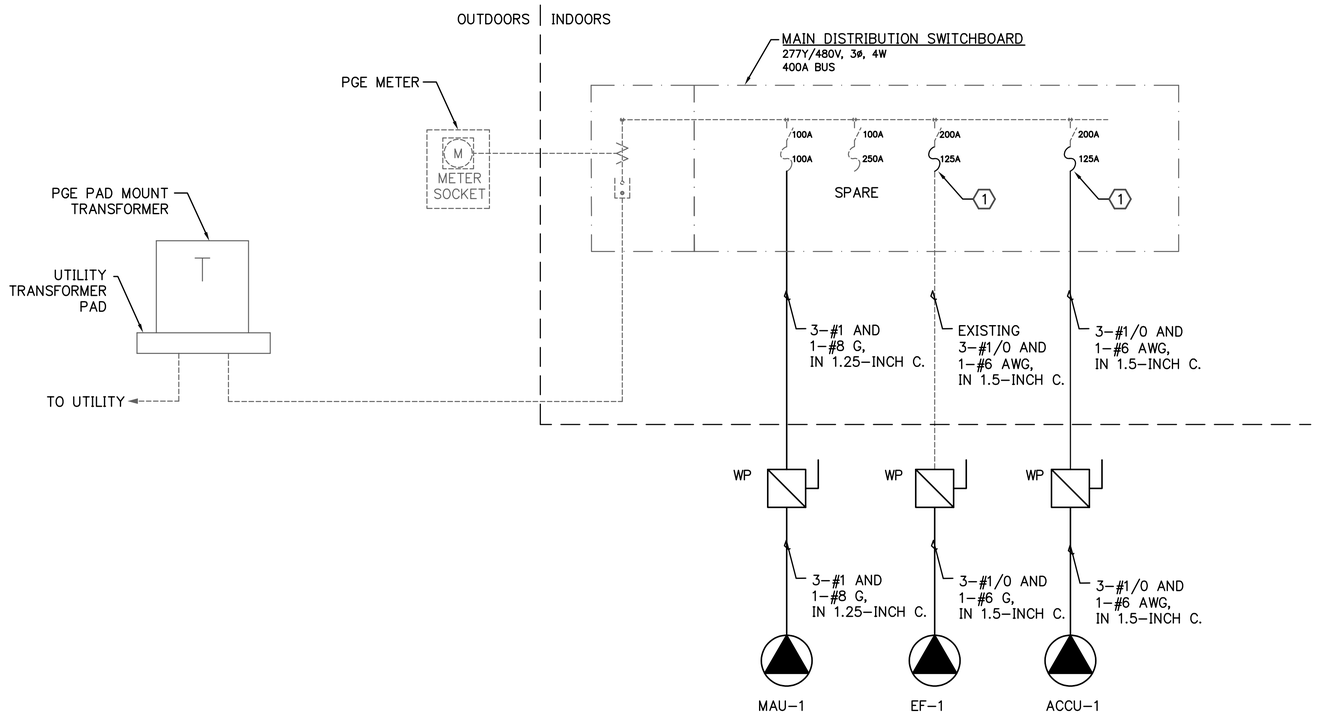
ENGINEER:
CUNDIFF ENGINEERING, INC. / CONSULTING ENGINEERS
7007 S.W. CARDINAL LANE, SUITE 145
PORTLAND, OREGON 97224
PH 503.521.7260, FX 503.521.7257

PROJECT NO.: 21-036

SEAL: 03/02/2022

DESIGN:	CMB/PA
DRAWN:	CMB/PA
CHECKED:	CMB/PA
DATE:	03/02/2022
SCALE:	AS SHOWN

SHEET: E201



1 M202 ONE LINE POWER RISER DIAGRAM
SCALE: N/A

Equip. No.	Description	Volts	Phase	- Motor - Hp	- Motor - FLA	Drive Hp	Starter Type	Fuse Ampere	Neutral Wire	-Cable (AWG)- P/N	-Cable (AWG)- G	VFD Cable	-Conduit - Size (in.)	-Conduit - # of Sets	Remarks
MAU-1	Makeup Air Unit	480	3	NA	65.00	NA	VFD	100	NO	1	8	NO	1.25	1	
EF-1	Exhaust Fan	480	3	NA	77.00	NA	VFD	125	NO	1/0	6	NO	1.5	1	
ACCU-1	Condensing Unit	480	3	NA	119.50	NA	VFD	125	NO	1/0	6	NO	1.5	1	

2 M202 EQUIPMENT SCHEDULE
SCALE: N/A

Estimated Electrical Load Summary

Description	*VA*	***Remarks***
Make-up Air Unit MU-1	54,040	
Exhaust Fan EF-1	64,017	
Condensing Unit ACCU-1	99,350	
Total kVA	217	
I-Line at 277/480V 3P, 4W	262	
Main Distribution Switchboard Rating	400	
Remain Capacity	138	

3 M202 LOAD SUMMARY
SCALE: N/A

NOTES THIS SHEET:

1. PROVIDE NEW FUSE IN EXISTING SWITCH AS SHOWN.

SYMBOL SCHEDULE:

- DUPLEX RECEPTACLE
- SPECIAL PURPOSE CONNECTION AS NOTED
- NON–FUSED DISCONNECT SWITCH
- SURFACE EQUIPMENT AS NOTED
- CONDUIT CONCEALED IN WALL, FLOOR OR CEILING
- CONDUIT BELOW GRADE
- DENOTES NOTE NUMBER
- DENOTES BRANCH CIRCUIT "HOME RUN"
  - DENOTES PHASE/SWITCH LEG
  - DENOTES NEUTRAL
  - DENOTES GROUND
- DENOTES EXISTING EQUIPMENT

ABBREVIATIONS:

C	CONDUIT
CBA	CIRCUIT BREAKER AMPERE
(E)	EXISTING
EMT	ELECTRICAL METALLIC TUBING
FLA	FULL LOAD AMPERE
G	GROUND
HP	HORSEPOWER
MDP	MAIN DISTRIBUTION PANELBOARD
MDS	MAIN DISTRIBUTION SWITCHBOARD
P/N	PHASE AND/OR NEUTRAL
#XP, #XG	PHASE AND GROUND CABLE AWG

REV	DESCRIPTION	DATE
0	ISSUE FOR CONSTRUCTION	2022-03-02

OWNER:
CLACKAMAS COUNTY PSTC
12700 SE 82ND AVE, CLACKAMAS, OR 97015

SHEET TITLE: ONE LINE POWER RISER DIAGRAM AND SCHEDULES

PROJECT NAME: FIRING RANGE HVAC REPLACEMENT

ENGINEER:
GUNDIFF ENGINEERING, INC. / CONSULTING ENGINEERS
7007 S.W. CARDINAL LANE, SUITE 145
PORTLAND, OREGON 97224
PH 503.521.7260, FX 503.521.7257

PROJECT NO.: 21-036

SEAL: 03/02/2022

DESIGN:	CMB/PA
DRAWN:	CMB/PA
CHECKED:	CMB/PA
DATE:	03/02/2022
SCALE:	AS SHOWN

SHEET: E202

MECHANICAL LEGEND

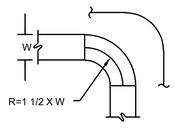
THIS LEGEND REFLECTS THE GENERALLY USED SYMBOLS BY CUNDIFF ENGINEERING SOME SYMBOLS SHOWN ON THIS LEGEND MAY NOT BE REFLECTED ON THE DRAWINGS.

COLD WATER
GAS (STND. PRESSURE) — G —
GAS (2 psi) — G2 —
90 DEGREE ELBOW
45 DEGREE ELBOW
PIPE ELBOW UP
PIPE ELBOW DOWN
PIPE CAP
PRESSURE GAUGE
REDUCER
SOLENOID VALVE
NEW CONNECTION TO EXISTING
HVAC EQUIPMENT SYMBOL, SEE SCHEDULES (FC 1)
EQUIPMENT

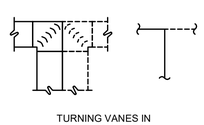
TEE
TEE UP ELBOW
TEE UP
TEE DOWN ELBOW
TEE DOWN
UNION
PRESSURE REGULATOR
GATE VALVE
BALL VALVE
GLOBE VALVE
BUTTERFLY VALVE
CHECK VALVE
STRAINER

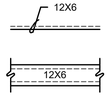
DUCT DETAILS (LOW VELOCITY)

DUCT SIZES ON PLANS ARE INSIDE DIMENSIONS AND UNITS ARE IN INCHES UNLESS INDICATED OTHERWISE.

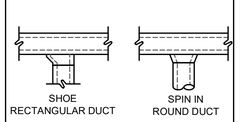


RADIUS ELBOW

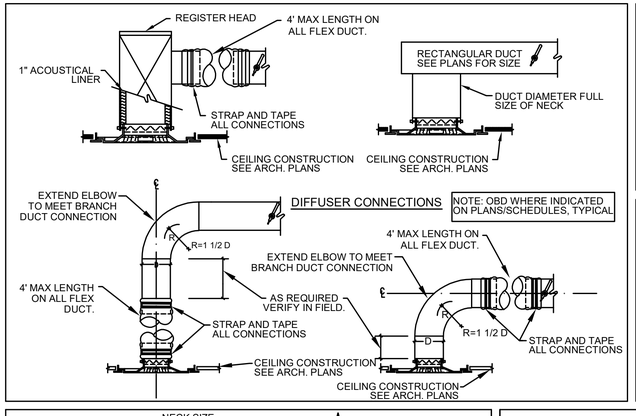

TURNING VANES IN ALL ELLS & TEES
MITER ELBOWS & TEES

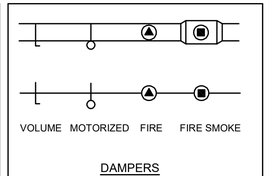


SIZE SHOWN IS CLEAR INSIDE DIMENSION
ACOUSTICAL LINER

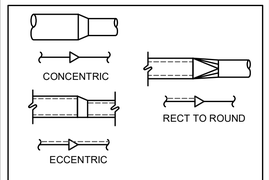


TAKEOFFS

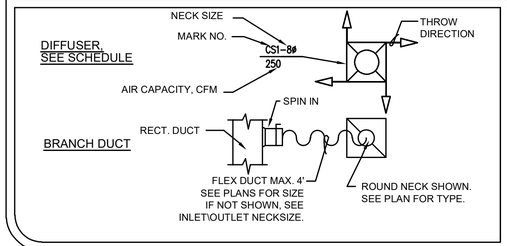


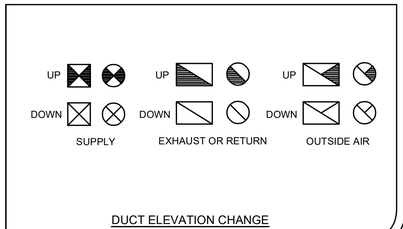


DAMPERS



TRANSITIONS





DUCT ELEVATION CHANGE

CONDENSING UNIT SCHEDULE

MARK NUMBER	ACCU-1
NOMINAL TONS	62.80
CAPACITY TO MATCH MARK NO.	MAU-1
AMBIENT CONDENSING TEMP DEG F	95
STATIC WEIGHT (LBS.)	3600
ELECTRICAL, VOLT/PHASE/MCA	460/3/119.5
EER	12.5
IEER	13.71
MANUFACTURER	ADDISON
MODEL #	MCOA-720

MAKE-UP AIR UNIT

MARK NUMBER	MAU-1
SERVING	FIRING RANGE
FAN:TYPE	
TOTAL CFM	44,000
MIN. O.A.	44,000
ESP (IN. WC)	3.25
DRIVE	DIRECT
WHEEL	SWSI BI AIRFOIL
FAN MOTOR HP	50
VOLTS/PH	460V/3PH
FILTER TYPE	2" PLEATED MERV8
HEATING:	
INPUT (MBH)	3000
OUTPUT (MBH)	3000
TURNDOWN	30:1
COOLING:	
SENSIBLE (MBH)	753
TOTAL (MBH)	753
ACCESSORIES:	
VFD CONTROLLED SUPPLY FAN	YES
S.S. HEAT EXHANGER	YES
MAXIMUM STATIC WEIGHT (LBS.)	11,100
MANUFACTURER	WEATHER RITE
MODEL NUMBER	TT3060

NOTE: FOR UNITS 2000 CFM OR GREATER ELECTRICAL CONTRACTOR WILL PROVIDE DUCT DETECTORS, MECHANICAL CONTRACTOR WILL INSTALL AND WIRE FOR FAN SHUT-DOWN.

ABBREVIATIONS:

A.F.F	ABOVE FINISH FLOOR
AL	ALUMINUM
CW	COLD WATER
CFM	CUBIC FEET PER MINUTE
DN	DOWN
(E)	EXISTING
ESP	EXTERNAL STATIC PRESSURE
HP	HORSEPOWER
IN. WC	INCHES WATER COLUMN
MAX.	MAXIMUM
MCA	MINIMUM CIRCUIT AMPS
MIN	MINIMUM
(N)	NEW
OA OR OSA	OUTSIDE AIR
PSI	POUNDS PER SQUARE INCH
RA	RETURN AIR
SA	SUPPLY AIR
SPECS	SPECIFICATIONS
TSP	TOTAL STATIC PRESSURE
VTR	VENT THROUGH ROOF

DETAIL INDICATOR

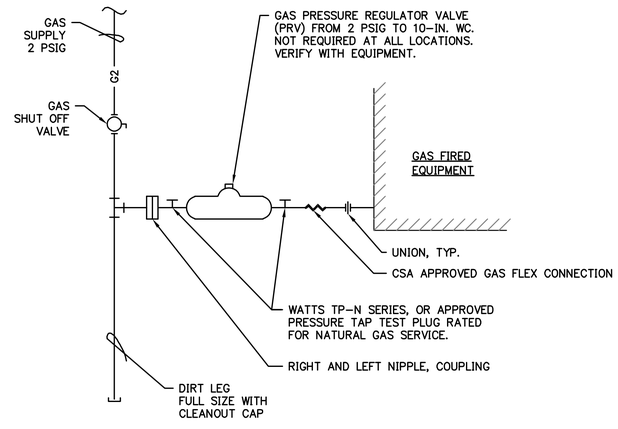
GAS CONNECTION SCHEDULE

MARK NUMBER	DESCRIPTION	LOCATION	INPUT, MBH
(E)RTU-1	WATER HEATER	ROOF	150
(E)RTU-2	WATER HEATER	ROOF	250
(E)WH-1	WATER HEATER	MECH ROOM	75
MAU-1	MAKEUP AIR UNIT	ROOF	3000
REMOVED MAKEUP AIR UNIT HAD 2850-MBH INPUT			
		TOTAL LOAD	3,475
		DEVELOPED LENGTH, FEET	240
MINIMUM 2-PSIG GAS MAIN SIZE INCHES PER TABLE C402.4(5)			2.00

EXHAUST FAN SCHEDULE

MARK NUMBER	EF-1
TYPE	UITILITY SET
SERVING	FIRING RANGE
FAN LOCATION	ROOF
CFM	48,000
TSP (IN. WC)	5.500
DRIVE	BELT
MAX FAN RPM	815
MOTOR HP.	60
VOLT/PH	460V/3PH
WHEEL TYPE	AIRFOIL
CONTROL	SEE SPECS
DAMPER TYPE	SEE SPECS
FAN ENERGY INDEX	1.36
UL 705 LISTED	YES
ISOLATION	SPRING
MAX SOUND SONES	60.0
MAXIMUM STATIC WEIGHT (LBS.)	4050
MANUFACTURER	GREENHECK
MODEL # [FAN]	USF-54
ACCESSORIES	SEE SPECS

INDEX OF HVAC DRAWINGS:



TYPICAL 2 PSIG DELIVERY PRESSURE GAS CONNECTION

1 / M001 DIAGRAMMATIC

DESIGN LOAD CALCULATION SUMMARY

OUTDOOR DESIGN CONDITIONS SUMMER: 88 DEG F DB/67 DEG F WB, WINTER 20 DEG F			DISCHARGE AIR DESIGN CONDITIONS COOLING: 72.3 DEG F DB / 61.8 DEG F WB, HEATING 70 DEG F		
SYSTEM ID	AREAS SERVED	HEATING DESIGN LOAD (BTU/H)	LATENT COOLING DESIGN LOAD (BTU/H)	SENSIBLE COOLING DESIGN LOAD (BTU/H)	CALCULATION METHOD USED
MAU-1 (44,000-CFM)	FIRING RANGES	2,420,000	-	749,518	ASHRAE FUNDAMENTALS

REV	DESCRIPTION	DATE
0	ISSUE FOR CONSTRUCTION	2022-03-02

OWNER: CLACKAMAS COUNTY PSTC
12700 SE 82ND AVE, CLACKAMAS, OR 97015

SHEET TITLE: COVERSHEET - HVAC
PROJECT NAME: FIRING RANGE HVAC REPLACEMENT

ENGINEER: CUNDIFF ENGINEERING, INC. / CONSULTING ENGINEERS
7007 S.W. CARDINAL LANE, SUITE 145
PORTLAND, OREGON 97224
PH 503.521.7260, FX 503.521.7257

PROJECT NO.: 21-036
SEAL: 03/02/2022

DESIGN:	CMB/PA
DRAWN:	CMB/PA
CHECKED:	CMB/PA
DATE:	03/02/2022
SCALE:	AS SHOWN

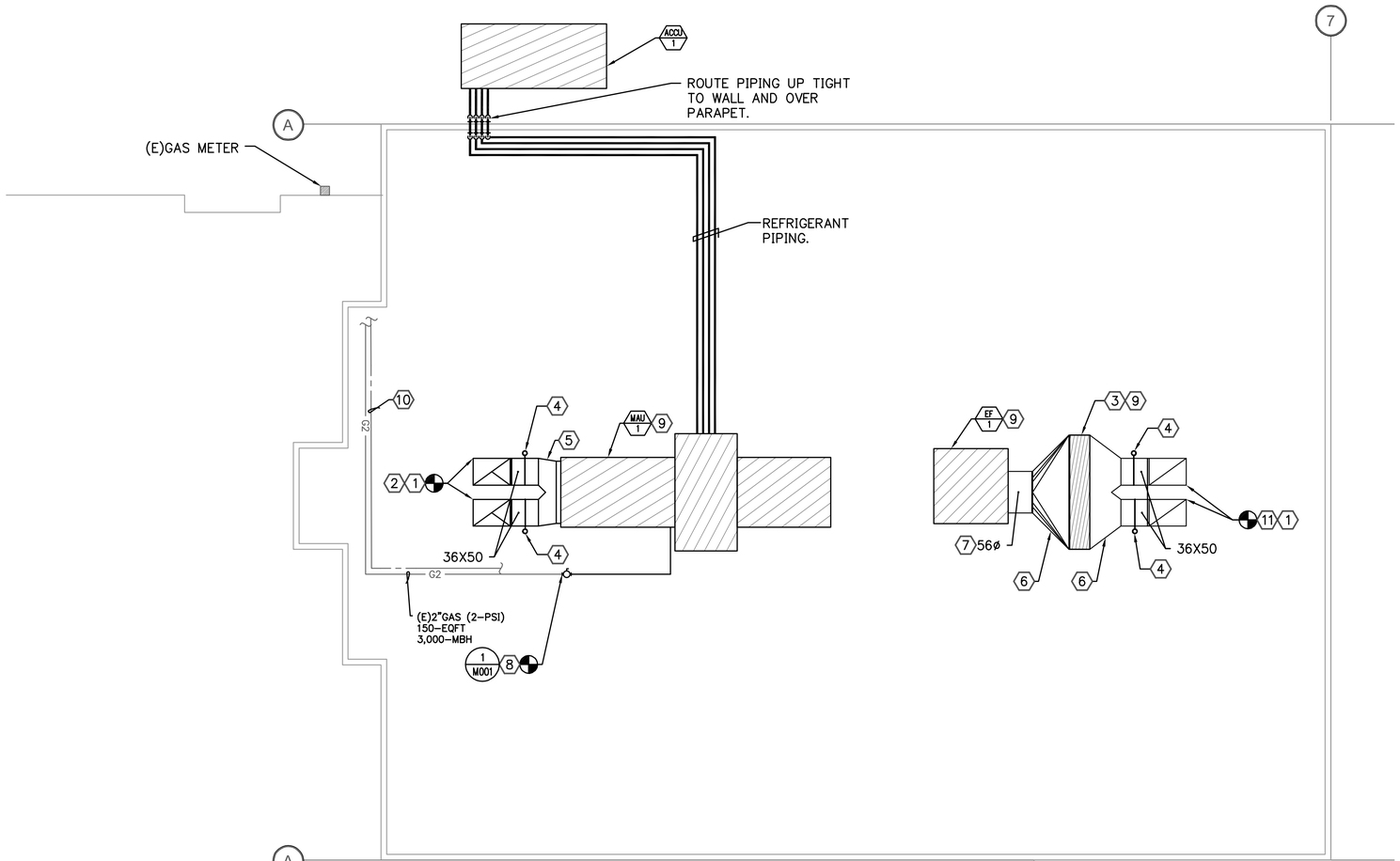
SHEET: M001

NOTES THIS SHEET:

1. CONNECT TO EXISTING DUCT PENETRATIONS. INSTALL TURNING VANES IN MITERED ELBOWS ABOVE AND BELOW ROOF.
2. BALANCE EACH SUPPLY TRUNK TO 22,000–CFM. REBALANCE EXISTING DIFFUSERS TO 2,200–CFM EACH.
3. NEW HEPA FILTER FRAME. SEE SPECIFICATIONS.
4. CONTROL DAMPERS. SEE SEQUENCE OF OPERATIONS IN SPECIFICATIONS.
5. MAXIMUM 35–DEGREE TRANSITION ANGLE.
6. MAXIMUM 45–DEGREE TRANSITION ANGLE.
7. DUCTWORK TO MATCH EXHAUST FAN INLET SIZE.
8. REPLACE GAS PIPING ISOLATION VALVE. REMOVE DOWNSTREAM PIPING AND REPLACE WITH NEW TO ACCOMMODATE UNIT REPLACEMENT. DRAWINGS INDICATE 2" PIPING. CONTRACTOR TO VERIFY EXACT SIZE IN FIELD.
9. REMOVE EXISTING EQUIPMENT AND ASSOCIATED SUPPORTS FOR INSTALLATION OF NEW.
10. REMOVE EXISTING COLD WATER LINE BACK TO INDOOR ISOLATION VALVE AND CAP. PATCH ROOF PENETRATION WEATHERTIGHT TO MATCH ADJACENT AREAS.
11. EACH EXHAUST TRUNK DESIGN AIRFLOW IS 24,000–CFM. BALANCE EACH TRUNK TO MAINTAIN A MAXIMUM NEGATIVE 0.1–INCHES WATER COLUMN IN THEIR CORRESPONDING SPACES, SUBJECT TO DESIGN AIRFLOW.

GENERAL NOTES

1. ALL EXISTING DUCTWORK, PIPING, EQUIPMENT, ETC. WERE TAKEN FROM EXISTING AVAILABLE RECORD DRAWINGS AND FIELD OBSERVATIONS. CONTRACTOR TO VERIFY EXACT CONDITIONS IN FIELD.
2. MAINTAIN INTEGRITY OF EXISTING PIPING, MECHANICAL AND BUILDING SYSTEMS ETC. SERVING ADJACENT SPACES IN AREAS OF NEW CONSTRUCTION.
3. WHERE WORK IMPACTS EXISTING CEILING, WALL, OR FLOOR FINISHES OR BUILDING COMPONENTS, CONTRACTOR TO PATCH TO MATCH ADJACENT SURFACES.
4. CONTRACTOR TO VERIFY EXACT CONDITIONS IN THE FIELD.



1 M201 ROOF PLAN - HVAC

SCALE: 0 8 16

SCALE IN FEET

NORTH

REV	DESCRIPTION	DATE
0	ISSUE FOR CONSTRUCTION	2022-03-02

OWNER: CLACKAMAS COUNTY PSTC
12700 SE 82ND AVE, CLACKAMAS, OR 97015

SHEET TITLE: ROOF PLAN - HVAC

PROJECT NAME: FIRING RANGE HVAC REPLACEMENT

ENGINEER: CMDIFF
ENGINEERING, INC., CONSULTING ENGINEERS
7007 S.W. CARDINAL LANE, SUITE 145
PORTLAND, OREGON 97224
PH 503.521.7260, FX 503.521.7257

PROJECT NO.: 21-036

SEAL: 03/02/2022

DESIGN:	CMB/PA
DRAWN:	CMB/PA
CHECKED:	CMB/PA
DATE:	03/02/2022
SCALE:	AS SHOWN

SHEET: M201

COM*check* Software Version COMcheckWeb

Mechanical Compliance Certificate

Project Information

Energy Code:	90.1 (2019) Standard
Project Title:	21-036
Location:	Clackamas, Oregon
Climate Zone:	4c
Project Type:	Alteration

Construction Site:
12700 SE 82nd Avenue
Clackamas, Oregon 97015

Owner/Agent:

Designer/Contractor:
Christopher Boyd
Cundiff Engineering, Inc.
7007 SW Cardinal Lane
Portland, Oregon 97224
5035217260
chrisb@cundiffmep.com

Mechanical Systems List

Quantity	System Type & Description
1	HVAC System Heating: 1 each - Central Furnace, Gas, Capacity = 2400 kBtu/h Proposed Efficiency = 95.00% Et, Required Efficiency: 80.00 % Et Cooling: 1 each - Single Package DX Unit, Capacity = 480 kBtu/h, Air-Cooled Condenser, Air Economizer Proposed Efficiency = 12.50 EER, Required Efficiency: 9.80 EER + 11.4 IEER SYSTEM VERIFICATION REQUIRED.

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2019) Standard requirements in COM*check* Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Christopher M. Boyd, P.E.		03/02/2022
Name - Title	Signature	Date

COM*check* Software Version COMcheckWeb

Inspection Checklist

Energy Code: 90.1 (2019) Standard

Requirements: 100.0% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
4.2.2, 6.4.4.2.1, 6.7.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Sheet M001.
4.2.2, 8.4.1.1, 8.4.1.2, 8.7 [PR6][2]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** N/A for Mechanical forms
4.2.5.2 [PR5][1]	Commissioning shall be performed as stated in Sections 5.9.2, 6.9.2, 7.9.2, 8.9.2, 9.9.2, 10.9.2, 11.2(d), and G1.2.1(c). Commissioning must utilize ASHRAE/IES Standard 202 or other generally accepted engineering standards acceptable to the building official. FPT and verification requirements for commissioning are as stated in Section 4.2.5.1. Commissioning shall document compliance of the building systems, controls, and building envelope with required provisions of this standard. Commissioning requirements shall be incorporated into the construction documents.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230050

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Footing / Foundation Inspection	Complies?	Comments/Assumptions
6.4.3.7 [FO9][3]	Freeze protection and snow/ice melting system sensors for future connection to controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.1.4, 6.4.1.5 [ME1][2]	HVAC equipment efficiency verified. Non-NAECA HVAC equipment labeled as meeting 90.1.	Efficiency:_____	Efficiency:_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
6.4.3.4.1 [ME3][3]	Stair and elevator shaft vents have motorized dampers that automatically close.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.3.4.2, 6.4.3.4.3 [ME4][3]	Outdoor air and exhaust systems have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Sheet M201.
6.4.3.4.5 [ME39][3]	Enclosed parking garage ventilation has automatic contaminant detection and capacity to stage or modulate fans to 50% or less of design capacity.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.3.4.4 [ME5][3]	Ventilation fans >0.75 hp have automatic controls to shut off fan when not required.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230993
6.4.3.8 [ME6][1]	Demand control ventilation provided for spaces >500 ft2 and >25 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Spaces where 75 percent of the supply outdoor airflow is requried for makeup air that is exhausted from the space or transfer air required for makeup air that is exhaused from the space(s).
6.5.3.2.1 [ME40][2]	DX cooling systems >= 75 kBtu/h (>= 65 kBtu/h effective 1/2016) and chilled-water and evaporative cooling fan motor hp >= ¼ designed to vary supply fan airflow as a function of load and comply with operational requirements.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. **Location on plans/spec:** Airflow to be constant for a firing range. *See the Mechanical Systems list for values.*
6.4.4.1.1 [ME7][3]	Insulation exposed to weather protected from damage. Insulation outside of the conditioned space and associated with cooling systems is vapor retardant.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230713
6.4.4.1.2 [ME8][2]	HVAC ducts and plenums insulated per Table 6.8.2. Where ducts or plenums are installed in or under a slab, verification may need to occur during Foundation Inspection.	R-_____	R-_____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230713
6.4.4.1.3 [ME9][2]	HVAC piping insulation thickness. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.	_____ in.	_____ in.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230713

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.4.4.1.4 [ME41][3]	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.4.2.1 [ME10][2]	Ducts and plenums having pressure class ratings are Seal Class A construction.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 233113
6.8.1-15, 6.8.1-16 [ME110][2]	Electrically operated DX-DOAS units meet requirements per Tables 6.8.1-15 or 6.8.1-16.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.4.4.2.2 [ME11][3]	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 233113
6.5.2.3 [ME19][3]	Dehumidification controls provided to prevent reheating, recooling, mixing of hot and cold airstreams or concurrent heating and cooling of the same airstream.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** N/A - No Dehumidification controls.
6.5.2.4.1 [ME68][3]	Humidifiers with airstream mounted preheating jackets have preheat auto-shutoff value set to activate when humidification is not required.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.2.4.2 [ME69][3]	Humidification system dispersion tube hot surfaces in the airstreams of ducts or air-handling units insulated >= R-0.5.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.2.5 [ME70][3]	Preheat coils controlled to stop heat output whenever mechanical cooling, including economizer operation, is active.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230993
6.5.2.6 [ME106][3]	Units that provide ventilation air to multiple zones and operate in conjunction with zone heating and cooling systems are prevented from using heating or heat recovery to warm supply air above 60°F when representative building loads or outdoor air temperature indicate that most zones demand cooling.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.3.3 [ME42][3]	Multiple zone VAV systems with DDC of individual zone boxes have static pressure setpoint reset controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. *See the Mechanical Systems list for values.*
6.5.4.2 [ME25][3]	HVAC pumping systems with >= 3 control values designed for variable fluid flow (see section details).			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
6.5.6.1.1 [ME56][1]	Exhaust Air Energy Recovery for Nontransient Dwelling Units			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** N/A - No dwelling units.
6.5.6.1.2 [ME111][1]	Exhaust air energy recovery for spaces other than Nontransient dwelling units meeting Tables 6.5.6.1.2-1, and 6.5.6.1.2-2.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirements do not apply. **Location on plans/spec:** Lead contaminated air, treated as Class 4 air per ASHRAE 62.1.
6.5.7.2.1 [ME32][2]	Kitchen hoods >5,000 cfm have make up air >=50% of exhaust air volume.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.3.8 [ME112][1]	Occupied standy controls for zones serving rooms that are required to have automatic partial OFF or automatic full OFF lighting controls per Section 9.4.1.1 shall meet the following within five minutes of all rooms in that zone entering occupied-standby mode: a)Active heating set point shall be setback at least 1°F, b)Active cooling set point shall be setup at least 1°F and c)All airflow supplied to the zone shall be shut off whenever the space temperature is between the active heating and cooling set points.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.7.2.4 [ME49][3]	Approved field test used to evaluate design air flow rates and demonstrate proper capture and containment of kitchen exhaust systems.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.8.1 [ME34][2]	Unenclosed spaces that are heated use only radiant heat.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.9 [ME35][1]	Hot gas bypass limited to: <=240 kBtu/h – 15% >240 kBtu/h – 10%			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 238126
6.4.3.9 [ME63][2]	Heating for vestibules and air curtains with integral heating include automatic controls that shut off the heating system when outdoor air temperatures > 45F. Vestibule heating and cooling systems controlled by a thermostat in the vestibule with heating setpoint <= 60F and cooling setpoint >= 80F.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
6.5.10 [ME73][3]	Doors separating conditioned space from the outdoors have controls that disable/reset heating and cooling system when open.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Alteration project to existing building.

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
8.4.2 [EL10][2]	At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
8.4.3 [EL11][2]	New buildings have electrical energy use measurement devices installed. Where tenant spaces exist, each tenant is monitored separately. In buildings with a digital control system the energy use is transmitted to to control system and displayed graphically.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.
10.4.1 [EL9][2]	Electric motors meet requirements where applicable.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230100

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
6.4.3.1.2 [FI3][3]	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230900
6.4.3.2 [FI20][3]	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230993
6.4.3.3.1 [FI21][3]	HVAC systems equipped with at least one automatic shutdown control.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230993
6.4.3.3.2 [FI22][3]	Setback controls allow automatic restart and temporary operation as required for maintenance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230993
6.4.3.12 [FI200][3]	Air economizer has a fault detection and diagnostics (FDD) system (see details for configuration and operational requirements).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply. **Location on plans/spec:** 100% OSA system.
6.4.3.6 [FI6][3]	When humidification and dehumidification are provided to a zone, simultaneous operation is prohibited. Humidity control prohibits the use of fossil fuel or electricity to produce RH > 30% in the warmest zone humidified and RH < 60% in the coldest zone dehumidified.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** N/A - No humidity controls provided.
6.7.2.1 [FI7][3]	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.2 [FI8][3]	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.7.2.3 [FI9][1]	An air and/or hydronic system balancing report is provided for HVAC systems serving zones >5,000 ft2 of conditioned area.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/spec:** Section 230593
10.4.3 [FI24][2]	Elevators are designed with the proper lighting, ventilation power, and standby mode.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

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AHU REPLACEMENT
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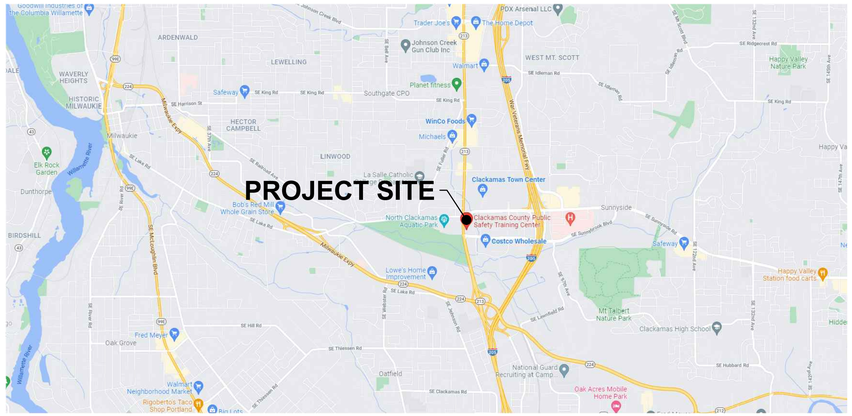
CLACKAMAS, OR 97015
FEBRUARY 2022



VICINITY MAP

SHEET LIST			
SHEET NUMBER	SHEET TITLE	REVISION NUMBER	REVISION DATE
S001	DRAWING INDEX	0	03/02/22
S002	STRUCTURAL NOTES	0	03/02/22
S003	STRUCTURAL NOTES	0	03/02/22
S101	FOUNDATION PLAN	0	03/02/22
S102	ROOF PLAN	0	03/02/22
S201	ELEVATIONS	0	03/02/22
S500	DETAILS	0	03/02/22
S501	DETAILS	0	03/02/22
M001	COVER SHEET - HVAC	0	03/02/22
M201	ROOF PLAN - HVAC	0	03/02/22
E201	ROOF PLAN - ELECTRICAL	0	03/02/22
E202	POWER RISER DIAGRAM & SCHEDULES	0	03/02/22

ABBREVIATIONS											
AB	ANCHOR BOLT	CONC	CONCRETE	FIN	FINISH	KSI	KIPS PER SQUARE INCH	OPG	OPENING	STD	STANDARD
ABT	ABOUT	CONN	CONNECTION	FL EL	FLOW ELEVATION	LAT	LATERAL	OPP	OPPOSITE	STIFF	STIFFENER
AC	ASPHALTIC CONCRETE	CONST	CONSTRUCTION	FLG	FLANGE	LBS	POUNDS	PCF	POUNDS PER CUBIC FOOT	STL	STEEL
ACI	AMERICAN CONCRETE INST.	CONT	CONTINUOUS, CONTINUITY	FLR	FLOOR	LG	LONG	PJF	PREMOLDED JOINT FILLER	STRUCT	STRUCTURAL
ADDL	ADDITIONAL	CONTD	CONTINUED	FOS	FACE OF STEEL	LL	LIVE LOAD	PL	PLATE	SYMM	SYMMETRICAL
ALT	ALTERNATE	CSK	COUNTERSINK	FS	FAR SIDE	LLH	LONG LEG HORIZONTAL	PLCS	PLACES	T & B	TOP & BOTTOM
APPRX	APPROXIMATE	Db	BAR DIAMETER	FT	FOOT OR FEET	LLV	LONG LEG VERTICAL	PROJ	PROJECTION	THD	THREAD
ARCH	ARCHITECTURAL	DBL	DOUBLE	FT-K	FOOT KIPS	LONGIT	LONGITUDINAL	PSF	POUNDS PER SQUARE FOOT	TOC	TOP OF CONCRETE
B TO B	BACK TO BACK	DEG	DEGREES	FTG	FOOTING	LP	LOW POINT	PSI	POUNDS PER SQUARE INCH	TOS	TOP OF STEEL
BLDG	BUILDING	DET	DETAIL	GA	GAUGE	LT	LIGHT	PT	PRESSURE TREATED	TS	TUBE STEEL
BLK	BLOCK	DIA	DIAMETER	GALV	GALVANIZED	LVF	LOW VELOCITY FASTENER	R	RADIUS	TYP	TYPICAL
BLKG	BLOCKING	DIM	DIMENSION	GLB	GLULAM BEAM	MANUF	MANUFACTURER	REF	REFERENCE	UNO	UNLESS NOTED OTHERWISE
BM	BEAM	DWG	DRAWING	GRD	GRADE	MAX	MAXIMUM	REINF	REINFORCING	VERT	VERTICAL
BOF	BOTTOM OF FOOTING	DWL	DOWEL	HCA	HEADED CONCRETE ANCHOR	MB	MACHINE BOLT	REQ	REQUIREMENT	VIF	VERIFY IN FIELD
BOP	BOTTOM OF PIPE	E	EXISTING	HDG	HOT DIPPED GALVANIZED	MECH	MECHANICAL	REQD	REQUIRED	W/	WITH
BOT	BOTTOM	EA	EACH	HGR	HANGER	MEZZ	MEZZANINE	RET W	RETAINING WALL	W/O	WITHOUT
BP	BASE PLATE	EF	EACH FACE	HORIZ	HORIZONTAL	MH	MANHOLE	REV	REVISION	WP	WORKPOINT
BRCG	BRACING	ELECT	ELECTRICAL	HP	HIGH POINT	MIN	MINIMUM	SC	SLIP CRITICAL	WS	WATERSTOP
BRG	BEARING	ELEV	ELEVATION	HR	HANDRAIL	MISC	MISCELLANEOUS	SCH	SCHEDULE	WT	WEIGHT
BRKT	BRACKET	EQUIP	EQUIPMENT	HS	HIGH STRENGTH	MO	MASONRY OPENING	SECT	SECTION		
BTWN	BETWEEN	ETC	ET CETERA	HSB	HIGH STRENGTH BOLT	N	NEW	SEL S	SELECT STRUCTURAL		
C	COPE	EW	EACH WAY	HSS	HOLLOW STRUCTURAL SECTION	NF	NEAR FACE	SHT	SHEET		
CB	CATCH BASIN	EXIST	EXISTING	HT	HEIGHT	NIC	NOT IN CONTRACT	SIM	SIMILAR		
CH PL	CHECKER PLATE	EXP	EXPANSION	IBC	INTERNATIONAL BUILDING CODE	NO	NUMBER	SLH	SHORT LEG HORIZONTAL		
CJ	CONTROL JOINT	F'c	COMPRESSIVE STRENGTH OF CONCRETE, PSI	ID	INSIDE DIAMETER	NOM	NOMINAL	SLV	SHORT LEG VERTICAL		
CJP	COMPLETE JOINT PENETRATION	F'm	COMPRESSIVE STRENGTH OF MASONRY, PSI	IE	INVERT ELEVATION	NS	NEAR SIDE	SN	SNIPE		
CL	CENTERLINE	F's	TENSILE STRENGTH OF STEEL, PSI	IN	INCH OR INCHES	NTS	NOT TO SCALE	SOG	SLAB ON GRADE		
CLR	CLEAR	FCO	FLOOR CLEANOUT	INS	INSULATION	O TO O	OUT TO OUT	SPA	SPACES OR SPACING		
CO	CLEANOUT	FD	FLOOR DRAIN	IWO	IN WAY OF	OC	ON CENTER	SPECS	SPECIFICATIONS		
COL	COLUMN	FDN	FOUNDATION	JT	JOINT	OD	OUTSIDE DIAMETER	SQ	SQUARE		
		FF	FAR FACE	K	KIPS	OH	OPPOSITE HAND	SS	STAINLESS STEEL		

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OREGON
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PATRICK K. MURPHY
EXPIRES: 12/31/2022

FILE NAME: P:\P21\21857_CLACKAMAS CO_PSTC_AHU\CAD\ENGINEERING\SHEETS\P21857_ST-CVR.DWG
SAVE TIME: 3/2/2022 10:03:47 AM PLOT TIME: 3/2/2022 10:05:34 AM
USER NAME: MATT PILSBURY
XREF FILES: P21857_TB_23x34.dwg

DESIGNED GM
DRAWN KM
CHECKED PM

SYM	REVISION	DATE	BY	APP'D
0	ISSUED FOR CONSTRUCTION	03/02/22	GM	PM

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VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DATE 03/02/22
SCALE AS INDICATED

DRAWING INDEX

JOB NUMBER 21857
DWG NAME: P21857_ST-CVR
SHEET S001

STRUCTURAL NOTES

GENERAL:

1. THESE STRUCTURAL NOTES SUPPLEMENT THE DRAWINGS. IF ERRORS, DISCREPANCIES, OR OMISSIONS ARE DISCOVERED IN THE DRAWINGS OR THESE NOTES OR IF ANY DISCREPANCIES ARE FOUND BETWEEN DRAWINGS AND SITE CONDITIONS, THE CONTRACTOR SHALL IMMEDIATELY REPORT THE ERRORS, DISCREPANCIES, OR OMISSIONS TO THE ENGINEER WHO SHALL RESPOND IN WRITING. ANY WORK DONE BY THE CONTRACTOR AFTER DISCOVERY OF SUCH DISCREPANCY SHALL BE DONE AT THE CONTRACTOR'S RISK.
2. CONDITIONS SHOWN AS EXISTING ARE BASED ON INFORMATION PROVIDED TO THE STRUCTURAL ENGINEER WHEN DRAWINGS WERE PREPARED. NO WARRANTY IS IMPLIED AS TO ACCURACY OF THESE EXISTING CONDITIONS.
3. THE CONTRACTOR SHALL VERIFY THE ACCURACY OF ALL EXISTING CONDITIONS DESCRIBED IN THE CONTRACT DOCUMENTS WITH FIELD MEASUREMENTS AND OBSERVATIONS PRIOR TO PROCEEDING WITH ANY WORK OR FABRICATION.
4. WHEN PERFORMING WORK, INCLUDING SHOP DRAWING DEVELOPMENT, CONSIDER REQUIREMENTS OF CONTRACT DOCUMENTS IN THEIR ENTIRETY (E.G., PIPING, CONDUITS, EMBEDMENTS, ACCESSORIES, ETC.).
5. STRUCTURAL DRAWINGS, AS PART OF CONTRACT DOCUMENTS, INDICATE INFORMATION SUFFICIENT TO CONVEY DESIGN INTENT. CONTRACT DOCUMENTS REPRESENT THE FINISHED STRUCTURE; UNLESS OTHERWISE SHOWN, THEY DO NOT INDICATE METHOD OF CONSTRUCTION.
6. THE CONTRACTOR IS RESPONSIBLE FOR ALL DEMOLITION AND CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES AS REQUIRED FOR THE WORK.
7. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF ALL ERECTION BRACING, FORM WORK, AND TEMPORARY SHORING REQUIRED FOR THE WORK.
8. THE CONTRACTOR SHALL PROVIDE ADEQUATE EXCAVATION PROCEDURES, SHORING, BRACING, AND ERECTION PROCEDURES COMPLYING WITH NATIONAL, STATE, AND LOCAL SAFETY ORDINANCES. CONTRACTOR IS RESPONSIBLE FOR MEETING ALL SAFETY REQUIREMENTS FOR THE PROJECT.
9. OBSERVATION VISITS TO SITE BY FIELD REPRESENTATIVES OF STRUCTURAL ENGINEER DO NOT INCLUDE REVIEW OF CONSTRUCTION MEANS AND METHODS OR SPECIAL AND CONTINUOUS INSPECTIONS. OBSERVATIONS ARE SOLELY FOR THE PURPOSE OF DETERMINING IF CONTRACTOR UNDERSTANDS DESIGN INTENT CONVEYED IN CONTRACT DOCUMENTS. OBSERVATIONS DO NOT GUARANTEE CONTRACTOR'S PERFORMANCE AND ARE NOT TO BE CONSTRUED AS SUPERVISION OR INSPECTION OF CONSTRUCTION.
10. MODIFICATIONS OR SUBSTITUTIONS MAY BE CONSIDERED PROVIDED A WRITTEN REQUEST, SUBJECT TO REVIEW, IS SUBMITTED TO STRUCTURAL ENGINEER PRIOR TO ITS USE, INSTALLATION IN THE FIELD, OR INCLUSION ON ANY SHOP DRAWING. COSTS ASSOCIATED WITH REVIEW, APPROVAL, AND INSTALLATION SHALL BE BORNE BY CONTRACTOR.
11. THE CAD DRAWING FILES ARE THE PROPERTY OF THE STRUCTURAL ENGINEER AND WILL NOT BE RELEASED TO THE CONTRACTOR OR SUBCONTRACTOR FOR THEIR USE.
12. ALL ABBREVIATIONS OF REFERENCED STANDARDS ARE PER IBC CHAPTER 35.
13. CONTRACTOR IS RESPONSIBLE FOR THE CONSTRUCTION OF WIND OR SEISMIC FORCE RESISTING SYSTEM/COMPONENT AS LISTED IN THE "STATEMENT OF SPECIAL INSPECTION". CONTRACTOR SHALL SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY TO THE GOVERNING CODE AUTHORITY AND THE OWNER PRIOR TO THE COMMENCEMENT OF WORK ON SUCH SYSTEM OR COMPONENT PER IBC SECTION 1704.4.

DESIGN CODES:

1. PERFORM CONSTRUCTION AND WORKMANSHIP IN COMPLIANCE WITH CONTRACT DOCUMENTS AND THE FOLLOWING CODES:
   - A. 2018 INTERNATIONAL BUILDING CODE
   - B. 2019 OREGON STRUCTURAL SPECIALTY CODE
2. ALL REFERENCE TO OTHER CODES AND STANDARDS (ACI, ASTM, ETC.) SHALL BE FOR THE LATEST OR MOST CURRENT EDITION AVAILABLE.
3. DESIGN CRITERIA:

A.	LIVE LOADS:		
	ROOF LIVE LOAD:	P_{FL} =	20 PSF
B.	SNOW LOADS:		
	ROOF SNOW LOAD:	P_f =	25 PSF
C.	WIND DESIGN DATA:		
	BASIC WIND SPEED	V_{ult} =	97 MPH
	RISK CATEGORY:		II
	WIND EXPOSURE		B
D.	EARTHQUAKE DESIGN DATA:		
	RISK CATEGORY:		II
	SEISMIC IMPORTANCE FACTOR:	I_e =	1
	MAPPED SPECTRAL RESPONSE ACCELERATION PARAMETERS	S_S =	0.871g
		S_1 =	0.381g
	SITE CLASS:		D
	DESIGN SPECTRAL RESPONSE ACCELERATION PARAMETERS:	S_{DS}	0.697g
	SEISMIC DESIGN CATEGORY:		D
E.	SOIL DATA (ASSUMED)		
	ALLOWABLE BEARING PRESSURE	σ	1500 PSF
	SOIL UNIT WEIGHT	γ =	120 PCF

ANCHORS IN CONCRETE & MASONRY

1. INSTALL ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
2. INSTALL WITH IBC SPECIAL INSPECTION ACCORDING TO SPECIAL INSPECTION PROGRAM.
3. ALL ANCHORS SHALL BE ICC/ICBO APPROVED
4. MECHANICAL ANCHORS, WHERE SPECIFIED ON THE DRAWINGS, SHALL CONFORM TO THE FOLLOWING:
   - A. CONCRETE EXPANSION ANCHORS: HILTI KWIK BOLT TZ (ESR-1917)
   - B. CONCRETE UNDERCUT ANCHORS: HILTI HAD (ESR-1546)
   - C. GROUTED REINFORCED CMU EXPANSION ANCHORS HILTI KWIK BOLT 3 (ESR-2302)
5. ADHESIVE ANCHORS, WHERE SPECIFIED ON THE DRAWINGS, SHALL CONFORM TO THE FOLLOWING:
   - A. CONCRETE EPOXY ANCHORS: HILTI HIT-RE 500-V3 (ESR-3814)
   - B. GROUTED REINFORCED CMU EPOXY ANCHORS: HILTI HIT-HY 200 (ESR-3187)
   - C. UNGROUTED OR UNREINFORCED MASONRY EPOXY ANCHORS: HILTI HIT-HY 70 (ESR-2682)

   ACCEPTABLE ADHESIVE INJECTION GEL SYSTEMS:
   - HILTI-RE-500-SD - HILTI (ESR 2322)
   - SET-XP - SIMPSON STRONG TIE (ESR 2508)
6. DRILLING SHALL BE PERFORMED WITH A ROTARY HAMMER DRILL AND CARBIDE TIPPED DRILL BIT IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND THE APPLICABLE ICC EVALUATION REPORT.
7. BORE HOLE CLEANING PROCEDURES MUST COMPLY WITH THE MANUFACTURER'S INSTRUCTIONS AND THE APPLICABLE ICC EVALUATION REPORT IN ORDER TO PRODUCE A DRY, DUST-FREE HOLE.
8. INJECTION OF ADHESIVE SHALL BE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND THE APPLICABLE ICC EVALUATION REPORT IN ORDER TO PRODUCE AN AIR-VOID FREE INJECTION.
9. SPECIAL CONDITIONS SUCH AS WATER SATURATED CONCRETE, WATER-FILLED HOLES, UNDERWATER AND OVERHEAD INSTALLATIONS MUST BE APPROVED BY THE ENGINEER OF RECORD AND COMPLY WITH THE APPLICABLE ICC-ES REPORT.
10. STEEL ANCHORING ELEMENTS SHALL BE THE SIZE AND GRADE SHOWN ON THE DRAWINGS AND MUST BE CLEAN, DRY AND FREE OF ANY OIL OR CONTAMINANTS.
11. SUBSTITUTIONS FOR ANCHOR SYSTEMS MUST BE APPROVED BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO INSTALLATION AND SHALL HAVE A VALID ICC-ES EVALUATION IN ACCORDANCE WITH THE APPLICABLE BUILDING CODE.
12. ALL ANCHOR EMBED DEPTHS SPECIFIED ON THESE DRAWINGS ARE EFFECTIVE EMBEDMENT DEPTHS. ADDITIONAL ANCHOR LENGTH AND OR HOLE DEPTH SHALL BE PROVIDED AS REQUIRED BY THE ANCHOR MANUFACTURER AND ASSOCIATED CODE APPROVALS..
13. INSALL ANCHORS EXPOSED TO WEATHER SHALL BE HDG OR SS.

SHOP DRAWINGS:

1. SUBMIT SHOP DRAWINGS TO ENGINEER FOR THE FOLLOWING:
   - A. CONCRETE MIX DESIGN
   - B. REINFORCING STEEL
   - C. STRUCTURAL AND MISCELLANEOUS STEEL INCLUDING WELD INSERTS AND ANCHORS (HDG OR SS)
   - D. PIPE SUPPORTS & SHOE DESIGN/LAYOUT (HDG OR SS)
2. REINFORCING STEEL SHOP DRAWINGS SHALL INDICATE REINFORCING PLACEMENT, INCLUDING SPLICE LOCATIONS AND LENGTHS. PROMPTLY NOTIFY STRUCTURAL ENGINEER PRIOR TO DEVELOPING REINFORCING STEEL SHOP DRAWINGS IF INSUFFICIENT CLEAR DISTANCES BETWEEN REINFORCING STEEL OR OTHER CONGESTION IS ENCOUNTERED. PREPARE SHOP DRAWINGS IN COMPLIANCE WITH ACI 315, PART B.
3. SUBMIT CONCRETE DESIGN MIX DATA FOR EACH TYPE AND COMPRESSIVE STRENGTH OF CONCRETE REQUIRED TO STRUCTURAL ENGINEER. BASE DESIGN MIX ON FIELD EXPERIENCE OR TRIAL MIXTURES, OR BOTH, AS STIPULATED IN ACI 318 SECTION 19.2
4. SHOP DRAWING SUBMITTALS:
   - A. CONTRACTOR SHALL REVIEW THE SUBMITTALS FOR COMPLETENESS AND COMPLIANCE WITH CONTRACT DOCUMENTS AND STAMP SHOP DRAWINGS DOCUMENTING THIS REVIEW PRIOR TO SUBMISSION.
   - B. SUBMIT SHOP DRAWINGS TO STRUCTURAL ENGINEER FOR REVIEW. DO NOT COMMENCE FABRICATION UNTIL REVIEW PROCESS IS COMPLETED.
   - C. WHEN AN ENGINEER IS REQUIRED TO SIGN AND STAMP SHOP DRAWINGS AND CALCULATIONS, THE SEAL SHALL INDICATE THAT THE ENGINEER IS REGISTERED IN THE STATE OF OREGON.
   - D. SHOP DRAWINGS ARE NOT A PART OF CONTRACT DOCUMENTS, AND REVIEW IS FOR GENERAL CONFORMANCE WITH DESIGN INTENT ONLY. STRUCTURAL ENGINEER'S REVIEW DOES NOT CONSTITUTE AN AUTHORIZATION TO DEVIATE FROM THE CONTRACT OR THE BUILDING CODE.
   - E. SHOP DRAWINGS WILL BE REJECTED FOR INCOMPLETENESS, LACK OF COORDINATION WITH OTHER PORTIONS OF CONTRACT DOCUMENTS, LACK OF CALCULATIONS (IF REQUIRED), OR WHERE MODIFICATIONS OR SUBSTITUTIONS ARE INDICATED WITHOUT PRIOR REVIEW.
   - F. SUBMIT SHOP DRAWINGS AND CALCULATIONS TO GOVERNING CODE AUTHORITY WHEN SPECIFICALLY INDICATED OR REQUESTED.
   - G. MAINTAIN A COPY OF ALL SHOP DRAWINGS ACCEPTED BY STRUCTURAL ENGINEER AT SITE DURING CONSTRUCTION PERIOD.
   - H. STRUCTURAL ENGINEER REQUIRES 10 WORKING DAYS AFTER RECEIPT OF SHOP DRAWINGS AND CALCULATIONS FOR PROCESSING.

CONCRETE (CAST IN PLACE):

1. ALL CONCRETE WORK TO CONFORM TO IBC CHAPTER 19.
2. PROVIDE NORMAL WEIGHT AGGREGATES OF NATURAL SAND AND ROCK COMPLYING WITH ASTM C33 (AGGREGATE SIZE).
3. PROVIDE PORTLAND CEMENT CONFORMING TO ASTM C150, TYPE II.
4. ALL CONCRETE SHALL BE NORMAL WEIGHT (145 PCF) AND SHALL DEVELOP A MINIMUM 28 DAY LABORATORY CURED, COMPRESSIVE CYLINDER STRENGTH OF:
   - 4,000 PSI FOR STRUCTURAL EQUIPMENT FOUNDATIONS
5. SAMPLES FOR STRENGTH TESTS OF EACH CLASS OF CONCRETE PLACED EACH DAY SHALL BE TAKEN NOT LESS THAN ONCE A DAY, NOR LESS THAN ONCE FOR EACH 50 CUBIC YARDS OF CONCRETE, NOR LESS THAN EACH 5000 SQUARE FEET OF SURFACE AREA FOR SLABS OR WALLS. FREQUENCY OF TESTING MAY BE CHANGED AT THE DISCRETION OF THE ENGINEER. SAMPLES AS IDENTIFIED IN THESE SPECIFICATIONS SHALL CONSIST OF A MINIMUM OF (5) CAST CYLINDERS: (1) TO BE CURED UNDER JOB CONDITIONS AND (4) IN AN APPROVED COMMERCIAL LABORATORY. CYLINDERS SHALL BE TESTED FOR COMPRESSIVE STRENGTH AS FOLLOWS:
   - (2) LAB CURED AT 7 DAYS
   - (2) LAB CURED AT 28 DAYS
   - (1) FIELD CURED AT 28 DAYS

   SLUMP, AIR ENTRAINMENT, LOCATION IN STRUCTURE, ETC. SHALL BE MEASURED AND RECORDED FOR EACH SET OF CYLINDERS, PER ASTM STANDARDS.
6. CONCRETE CYLINDER AND TESTING SHALL CONFORM TO ASTM STANDARDS.
7. CONCRETE, FORMS, MIXING, PLACING, AND CURING SHALL CONFORM TO THE ACI MANUAL OF CONCRETE PRACTICE, LATEST EDITION, AND SPECIFICATIONS.
8. CONCRETE SLUMP NOT TO EXCEED 4 (± 1) INCHES. FOR SLAB ON GRADE, WALLS, SLAB ON METAL DECK, AND SUSPENDED SLABS, SLUMP NOT TO EXCEED 4 (+0, -1) INCHES.
9. CONCRETE SHALL BE PLACED IN ONE CONTINUOUS OPERATION.
10. CONCRETE MIX SHALL CONTAIN 4% MIN AIR ENTRAPMENT.
11. DO NOT USE CONCRETE OR GROUT CONTAINING CHLORIDES.
12. DO NOT EMBED CONDUITS, PIPES, OR SLEEVES IN STRUCTURAL CONCRETE, INCLUDING SLABS ON METAL DECK, EXCEPT WHERE SPECIFICALLY DETAILED OR ACCEPTED BY STRUCTURAL ENGINEER. LOCATE ELECTRICAL CONDUIT 3" APART MINIMUM AND WITHIN MIDDLE THIRD OF MEMBER.
13. MAINTAIN CONCRETE ABOVE 50 DEGREES FAHRENHEIT AND IN A MOIST CONDITION FOR A MINIMUM OF 7 DAYS AFTER PLACEMENT UNLESS OTHERWISE ACCEPTED BY STRUCTURAL ENGINEER.
14. ALL ANCHOR BOLTS IN CONCRETE SHALL CONFORM TO ASTM SPECIFICATION A301 AND SHALL BE OF THE SIZE INDICATED ON THE DRAWINGS. .
15. FORM EXPOSED CORNERS OF COLUMNS, BEAMS, WALLS, ETC., WITH 3/4-INCH CHAMFERS UNLESS DETAILED OTHERWISE.
16. BASE PLATES AND ANCHOR BOLTS BELOW GRADE SHALL BE COVERED WITH A MINIMUM OF 3" OF CONCRETE.
17. APPROVED BONDING AGENT MANUFACTURERS AS FOLLOWS:
   - SIKA
   - EUCLID
   - W.R. MEADOWS
   - ALTERNATIVE MANUFACTURERS TO BE SENT TO STRUCTURAL ENGINEER FOR APPROVAL

FOUNDATIONS:

1. FOOTING ELEVATIONS ARE AS SHOWN ON DRAWINGS.
2. FOOTINGS SHALL BE FOUNDED ON FIRM, UNDISTURBED SOIL OR ON APPROVED STRUCTURAL FILL.
3. STRUCTURAL FILL SHALL CONSIST OF CLEAN, WELL-GRADED SAND, SAND AND GRAVEL, OR CRUSHED ROCK OR AS SPECIFIED IN THE SOILS REPORT.
4. STRUCTURAL FILL SHALL BE PLACED IN LOOSE LIFTS NOT EXCEEDING 8" IN THICKNESS AND SHALL BE COMPACTED TO 92% OF THE MAXIMUM DRY DENSITY AS OBTAINED BY MODIFIED PROCTOR (ASTM D1557).
5. ALL FOUNDATIONS SHALL HAVE MINIMUM DEPTH OF 1'-6" BELOW LOWEST ADJACENT FINAL FINISH FLOOR OR GRADE.
6. EXPOSED SOIL SHALL BE INSPECTED FOR COMPLIANCE WITH THE SOILS REPORT BY THE INSPECTION AGENCY REPRESENTATIVE PRIOR TO CONSTRUCTING CONCRETE FORMS AND/OR PLACING REINFORCING STEEL. ANY EXCESS OR NON-COMPLYING MATERIAL AS DETERMINED BY THE INSPECTION AGENCY REPRESENTATIVE SHALL BE REMOVED AND REPLACED AS DIRECTED BY THE SOILS ENGINEER.
7. CONTRACTOR SHALL BRACE OR PROTECT ALL BUILDING AND PIT WALLS BELOW GRADE FROM LATERAL LOADS UNTIL ATTACHING FLOORS ARE COMPLETELY IN PLACE AND HAVE ATTAINED FULL DESIGN STRENGTH. CONTRACTOR SHALL PROVIDE FOR THE DESIGN, PERMITS AND INSTALLATION OF SUCH BRACING. RETAINING WALLS SHALL HAVE ATTAINED FULL DESIGN STRENGTH PRIOR TO BEING BACKFILLED.
8. CONTRACTOR SHALL PROVIDE FOR THE DESIGN AND INSTALLATION OF ALL CRIBBING, SHEATHING AND SHORING REQUIRED TO SAFELY RETAIN ALL EARTH BANKS.
9. ALL WALKWAYS AND OTHER EXTERIOR SLABS ON GRADE MAY NOT BE SHOWN ON THE STRUCTURAL PLANS. USE 4" THICK CONCRETE SLABS WITH 6x6-W1.4xW1.4 WWF MATS, UNLESS SHOWN OTHERWISE.
10. CONTRACTOR SHALL PROVIDE FOR DE-WATERING OF EXCAVATIONS FROM SURFACE WATER, GROUND WATER OR SEEPAGE.

NON-SHRINK GROUT:

1. CONFORM WITH ASTM C1107 AND CRD-C621 CORPS OF ENGINEERS "SPECIFICATIONS FOR NON-SHRINK GROUT".
2. SPECIFIED 28 DAY COMPRESSIVE STRENGTH: 5,000 PSI
3. DO NOT PRE-GROUT PLATES.

REINFORCING STEEL:

1. REINFORCING BARS SHALL BE NEW BILLET STEEL AND SHALL CONFORM TO:
   - ALL REINFORCEMENT UNO: ASTM A706, GRADE 60
   - REINFORCING AT FOUNDATION, SUSPENDED SLAB, SLAB ON GRADE, AND ALL TIES: ASTM A615, GRADE 60

   ASTM A615, GRADE 60 REINFORCING MAY BE USED IN LIEU OF ASTM A706 REINFORCING AS PERMITTED BY ACI 318, UNLESS NOTED OTHERWISE.
2. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A-185
3. ALL WELDED REINFORCING STEEL, METAL INSERTS, AND CONNECTIONS SHALL CONFORM TO ACI AND CRSI STANDARDS.
4. ALL WELDING OF REINFORCING STEEL SHALL COMPLY WITH AWS D1 4. IF WELDING OF REINFORCING STEEL OTHER THAN A706 IS DESIRED, SUBMIT PROPOSED PROCEDURE, INDICATING CONFORMANCE TO CODE AND REQUIREMENTS OF GOVERNING CODE AUTHORITY, TO STRUCTURAL ENGINEER FOR ACCEPTANCE AND TO GOVERNING CODE AUTHORITY FOR APPROVAL PRIOR TO EXECUTION. WELDERS SHALL BE CERTIFIED AS REQUIRED BY GOVERNING CODE AUTHORITY.
5. NO TACK WELDING OF REINFORCING STEEL IS PERMITTED WITHOUT PRIOR REVIEW BY STRUCTURAL ENGINEER.
6. SECURELY TIE ANCHOR BOLTS, REINFORCING STEEL, INSERTS, ETC., IN PLACE PRIOR TO POURING CONCRETE OR GROUT. BARS ADJACENT TO EARTH SHALL BE SUPPORTED BY CEMENT MORTAR CUBES.
7. ALL REINFORCING BAR BENDS SHALL BE MADE COLD. BARS SHALL NOT BE RE-BENT.
8. REINFORCEMENT SHALL BE DETAILED, FABRICATED, AND PLACED IN ACCORDANCE WITH ACI CODE 318 AND ACI MANUAL 315 UON. ALL REINFORCEMENT SHALL BE FREE OF LOOSE MILL AND RUST SCALE, OIL, DIRT, AND COATINGS OF ANY MANNER THAT WILL REDUCE BOND. ALL REINFORCEMENT SHALL BE CONTINUOUS WITH ADEQUATE LAPS AS SPECIFIED HEREIN.
9. DOWELS BETWEEN FOOTINGS AND WALLS OR COLUMNS SHALL BE THE SAME GRADE, SIZE AND SPACING AS THE VERTICAL REINFORCING, RESPECTIVELY, UNO.
10. CHAIRS OR SPACERS FOR REINFORCING SHALL BE PLASTIC OR PLASTIC COATED WHEN RESTING ON EXPOSED SURFACES.
11. NO BARS PARTIALLY EMBEDDED IN HARDENED CONCRETE SHALL BE FIELD BENT UNLESS SPECIFICALLY SO DETAILED AND REVIEWED BY THE STRUCTURAL ENGINEER.
12. REINFORCING LAP SPLICES (INCHES) SHALL CONFORM WITH ACI 318 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE", AS SHOWN BELOW, UNO ON DRAWINGS.

	3,000 PSI		4,000 PSI		5,000 PSI	
BAR SIZE	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS
#3	28"	22"	24"	19"	22"	17"
#4	37"	29"	32"	25"	29"	22"
#5	47"	36"	40"	31"	36"	28"
#6	56"	43"	48"	37"	43"	33"
#7	81"	63"	70"	54"	63"	49"
#8	93"	72"	80"	62"	72"	55"
#9	105"	81"	91"	70"	81"	63"
#10	118"	91"	102"	79"	91"	70"
#11	131"	101"	113"	87"	101"	78"

   LAP SPICE NOTES:
   - A. TOP BARS ARE DEFINED AS HORIZONTAL BARS PLACED SUCH THAT MORE THAN 12" OF CONCRETE IS PLACED BELOW THE BARS.
   - B. SPLICE LENGTH BASIS: CLASS B, CASE 1 SPLICE, WITH CENTER-TO-CENTER BAR SPACING OF GREATER THAN (3) BAR DIAMETERS.
   - C. INCREASE SPLICE LENGTHS BY 50% IF CLEAR DISTANCES ARE LESS THAN 2 BAR DIAMETERS, BUT NEVER LESS THAN MINIMUM CLEAR DISTANCES INDICATED BELOW.
13. MAINTAIN THE FOLLOWING MINIMUM CLEAR DISTANCES BETWEEN REINFORCING STEEL (OR ENCASED STRUCTURAL STEEL) AND FACE OF CONCRETE UNO:
   - A. CONCRETE CAST AGAINST AND PERMANENTLY IN CONTACT WITH GROUND: 3"
   - B. CONCRETE EXPOSED TO WEATHER OR IN CONTACT WITH GROUND: 2"
   - C. CONCRETE NOT EXPOSED TO EARTH OR WEATHER:
     - SLABS, WALLS, AND JOISTS, #11 AND SMALLER 3/4"
     - BEAMS, COLUMNS, PEDESTALS AND TENSION TIES 1-1/2"
14. PLACE (2) #5 BARS x OPENING DIMENSION PLUS 4'-0" EACH SIDE OF ALL OPENINGS AND (2) #5 x 4'-0" DIAGONAL BARS AT EACH CORNER OF ALL SLAB OPENINGS GREATER THAN 1'-6" PLACED AT EACH LAYER OF REINFORCING STEEL.
15. TERMINATE ALL CONT. BARS WITH STD HOOK AT EACH END.

STRUCTURAL OBSERVATION:

1. STRUCTURAL OBSERVATION IS REQUIRED FOR THE STRUCTURAL SYSTEM IN ACCORDANCE WITH IBC SECTION 1704.6. STRUCTURAL OBSERVATION IS THE VISUAL OBSERVATION OF THE ELEMENTS AND CONNECTIONS OF THE STRUCTURAL SYSTEM AT SIGNIFICANT CONSTRUCTION STAGES AND THE COMPLETED STRUCTURE FOR GENERAL CONFORMANCE TO THE APPROVED PLANS AND SPECIFICATIONS. STRUCTURAL OBSERVATION DOES NOT WAIVE THE RESPONSIBILITY FOR THE INSPECTIONS REQUIRED OF THE BUILDING INSPECTOR OR THE SPECIAL INSPECTOR.
2. THE OWNER SHALL EMPLOY A REGISTERED DESIGN PROFESSIONAL TO PERFORM THE STRUCTURAL OBSERVATION. THE STRUCTURAL ENGINEER SHALL BE REGISTERED OR LICENSED IN THE STATE OF OREGON. THE DEPARTMENT OF BUILDING AND SAFETY RECOMMENDS THE USE OF THE STRUCTURAL ENGINEER RESPONSIBLE FOR THE STRUCTURAL DESIGN WHEN THEY ARE INDEPENDENT OF THE CONTRACTOR.
3. THE OWNER OR OWNER'S REPRESENTATIVE SHALL COORDINATE AND CALL FOR A MEETING BETWEEN THE STRUCTURAL ENGINEER RESPONSIBLE FOR THE STRUCTURAL DESIGN, STRUCTURAL OBSERVER, CONTRACTOR, AFFECTED SUBCONTRACTORS, AND DEPUTY INSPECTORS. THE PURPOSE OF THE MEETING SHALL BE TO IDENTIFY THE MAJOR STRUCTURAL ELEMENTS AND CONNECTIONS THAT AFFECT THE VERTICAL AND LATERAL LOAD SYSTEMS OF THE STRUCTURE AND TO REVIEW SCHEDULING OF THE REQUIRED OBSERVATIONS. A RECORD OF THE MEETING SHALL BE INCLUDED IN THE FIRST OBSERVATION REPORT SUBMITTED TO THE BUILDING INSPECTOR.
4. THE STRUCTURAL OBSERVER SHALL PERFORM SITE VISITS AT THOSE STEPS IN THE PROGRESS OF THE WORK THAT ALLOW FOR CORRECTION OF DEFICIENCIES WITHOUT SUBSTANTIAL EFFORT OR UNCOVERING OF THE WORK INVOLVED. AT A MINIMUM, THE FOLLOWING SIGNIFICANT CONSTRUCTION STAGES REQUIRE A SITE VISIT AND AN OBSERVATION REPORT FROM THE STRUCTURAL OBSERVER:

	CONSTRUCTION STAGE	ELEMENTS/CONNECTIONS TO BE OBSERVED
A.	FOUNDATIONS:	FOLLOWING PLACEMENT OF REINFORCING STEEL, EMBEDDED PLATES AND ANCHOR BOLTS, ETC.
B.	EQUIPMENT INSTALLATION:	ANCHORAGE BEFORE BEING COVERED UP.

5. THE STRUCTURAL OBSERVER SHALL PREPARE A REPORT FOR EACH SIGNIFICANT STAGE OF CONSTRUCTION OBSERVED. THE ORIGINAL OF THE OBSERVATION REPORT SHALL BE SENT TO THE BUILDING INSPECTOR'S OFFICE AND SHALL BE SIGNED AND SEALED (WET OR ELECTRONIC STAMP) BY THE STRUCTURAL OBSERVER. ONE COPY OF THE OBSERVATION REPORT SHALL BE ATTACHED TO THE APPROVED PLANS. COPIES OF THE REPORT SHALL ALSO BE GIVEN TO THE OWNER, CONTRACTOR, AND DEPUTY INSPECTOR.
6. A FINAL OBSERVATION REPORT MUST BE SUBMITTED TO THE BUILDING OFFICIAL, OWNER, AND STRUCTURAL ENGINEER THAT STATES THAT THE SITE VISITS HAVE BEEN MADE, THAT ALL REPORTED DEFICIENCIES HAVE, TO THE BEST OF THE STRUCTURAL OBSERVER'S KNOWLEDGE, BEEN CORRECTED, AND THAT THE STRUCTURAL SYSTEM IN GENERAL CONFORMS TO THE APPROVED PLANS AND SPECIFICATIONS.

STATEMENT OF SPECIAL INSPECTION

1. TESTING LABORATORY SHALL SUBMIT REPORTS INDICATING RESULTS AND OBSERVATIONS OF TESTS AND INSPECTIONS AND STATING COMPLIANCE OR NONCOMPLIANCE WITH CONTRACT DOCUMENTS TO STRUCTURAL ENGINEER AND TO GOVERNING CODE AUTHORITY. CONTRACTOR SHALL REIMBURSE OWNER FOR COSTS RELATED TO TESTS AND INSPECTIONS OF UNIDENTIFIABLE MATERIALS OR MATERIALS FURNISHED WITHOUT CERTIFIED LABORATORY TEST REPORTS, MATERIALS FOUND DEFICIENT AFTER INITIAL TESTS AND INSPECTIONS, OR MATERIALS REPLACING DEFICIENT MATERIALS. SEE SPECIFICATIONS FOR ADDITIONAL TEST AND INSPECTION REQUIREMENTS.
2. PROVIDE CEMENT, AGGREGATES, REINFORCING STEEL, STRUCTURAL STEEL, HIGH-STRENGTH BOLTS, ETC., FROM IDENTIFIABLE TESTED STOCK. SUBMIT CERTIFIED LABORATORY TEST REPORTS TO STRUCTURAL ENGINEER AND TO GOVERNING CODE AUTHORITY. IF MATERIALS CANNOT BE IDENTIFIED OR IF CERTIFIED LABORATORY TEST REPORTS CANNOT BE MADE AVAILABLE, TESTING LABORATORY WILL PERFORM TESTS TO DETERMINE CONFORMANCE WITH CONTRACT DOCUMENTS AS DIRECTED BY STRUCTURAL ENGINEER.
3. TESTING LABORATORY SHALL PROVIDE SPECIAL INSPECTION, COMPLYING WITH IBC SECTION 1701 (UNO), FOR THE FOLLOWING:
   - A. FOUNDATION PREPARATION
   - B. REINFORCING STEEL PLACEMENT
   - C. CONCRETE SAMPLING & STRENGTH TESTING
   - D. POST-INSTALLED CONCRETE ANCHORS
4. TESTING LABORATORY SHALL REVIEW CONCRETE MIX DESIGN DATA AND SHALL PERFORM THE CONCRETE TESTS SPECIFIED IN THE TABLE BELOW AT FREQUENCY INDICATED IN REQUIRED INSPECTIONS OF REINFORCED CONCRETE IN QUALITY ASSURANCE SECTION.
5. TESTING LABORATORY SHALL PERFORM THE TESTS IN STRUCTURAL STEEL SPECIFIED IN THE TABLE BELOW AS INDICATED IN REQUIRED INSPECTIONS OF STRUCTURAL STEEL IN QUALITY ASSURANCE SECTION.
6. TESTING LABORATORY SHALL PERFORM THE TESTS FOR COMPACTED STRUCTURAL FILL SPECIFIED IN THE TABLE BELOW AS INDICATED IN REQUIRED INSPECTIONS OF STRUCTURAL FILL IN QUALITY ASSURANCE SECTION.
7. THE FOLLOWING REQUIREMENTS SHALL APPLY TO WELDING INSPECTIONS PERFORMED FOR THE PROJECT:
   - A. THE LEAD WELDING INSPECTOR SHALL BE A CERTIFIED WELDING INSPECTOR (CWI) PER AWS-QC1 STANDARDS, SHALL BE APPROVED BY THE STRUCTURAL OBSERVER AND CERTIFIED BY THE BUILDING OFFICIAL AS A REGISTERED DEPUTY INSPECTOR FOR STRUCTURAL STEEL WELDING (ICC-ES CERTIFICATION), AND SHALL POSSESS A MINIMUM LEVEL OF UT LEVEL II CERTIFICATION. OTHER WELDING INSPECTORS PERFORMING VISUAL INSPECTION UNDER THE SUPERVISION OF THE LEAD WELDING INSPECTOR SHALL POSSESS ICC-ES CERTIFICATION, AND PERSONS PERFORMING NONDESTRUCTIVE TESTING SHALL POSSESS UT LEVEL II CERTIFICATION. NOT MORE THAN FOUR NON-CWI INSPECTORS SHALL BE UNDER THE SUPERVISION OF A CWI. CERTIFICATION BY ICC-ES IS NOT AN ACCEPTABLE SUBSTITUTE FOR CLA CERTIFICATION.
   - B. ALL INSPECTION REQUIREMENTS SHALL BE REQUIRED BY AWS D1.1 AND THE QUALITY ASSURANCE SECTION INCLUDING INSPECTION TABLES.

STRUCTURAL REGISTERED PROFESSIONAL ENGINEER 15002 OREGON JULY 25, 1990 PATRICK K. MURPHY
EXPIRES: 12/31/2022

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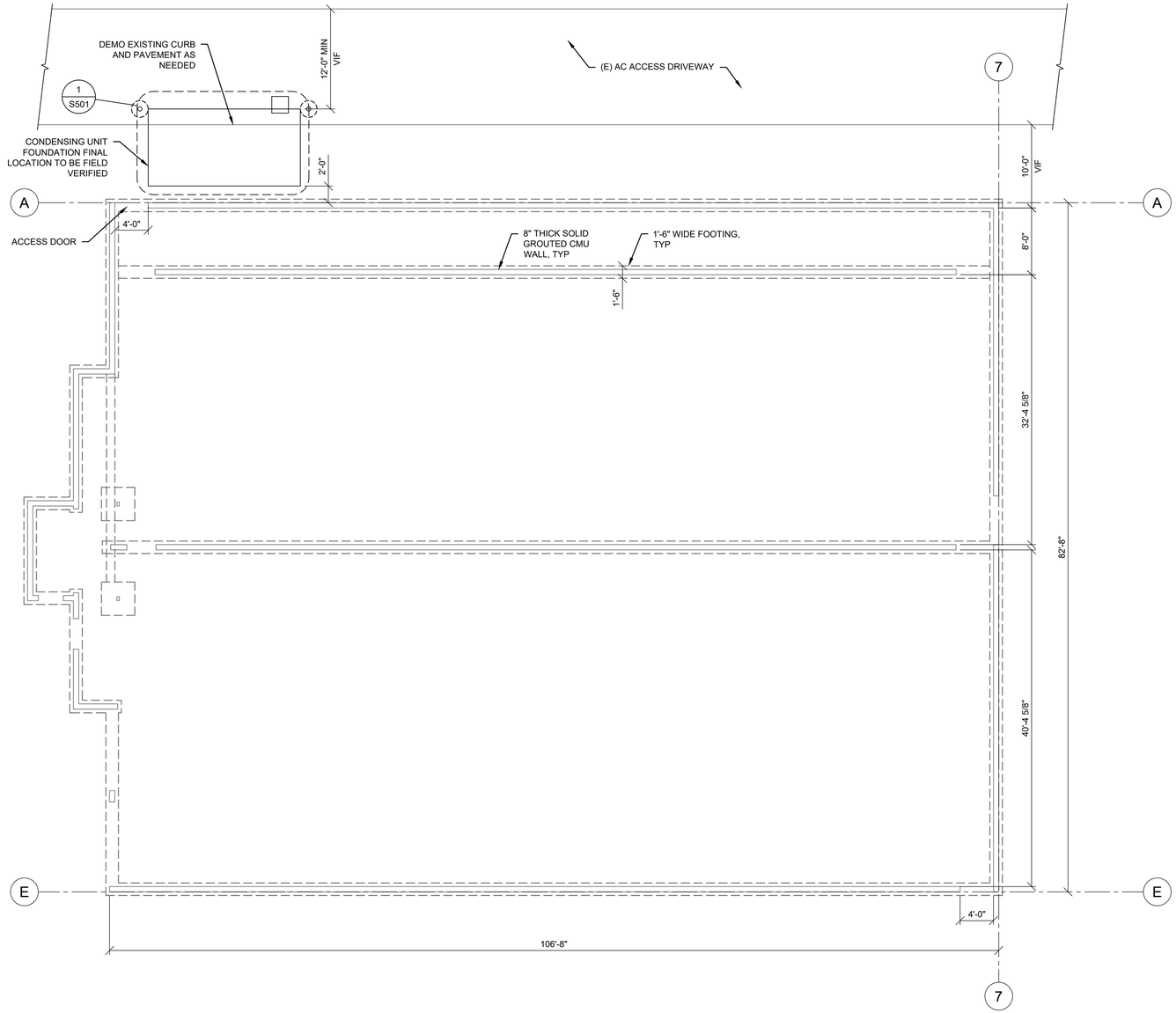
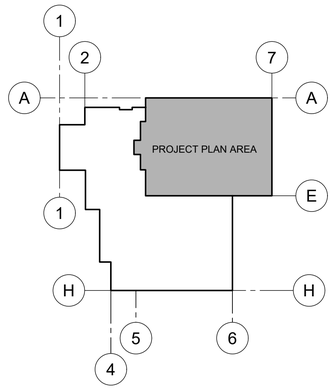
STRUCTURAL NOTES

JOB NUMBER 21857
DWG NAME: P21857_ST-NOTE
SHEET S002





KEYPLAN

1 / S101
FOUNDATION PLAN : 1/8" = 1'-0"

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EXPIRES: 12/31/2022

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FOUNDATION PLAN

JOB NUMBER 21857
DWG NAME: P21857_ST-PLAN
SHEET S101

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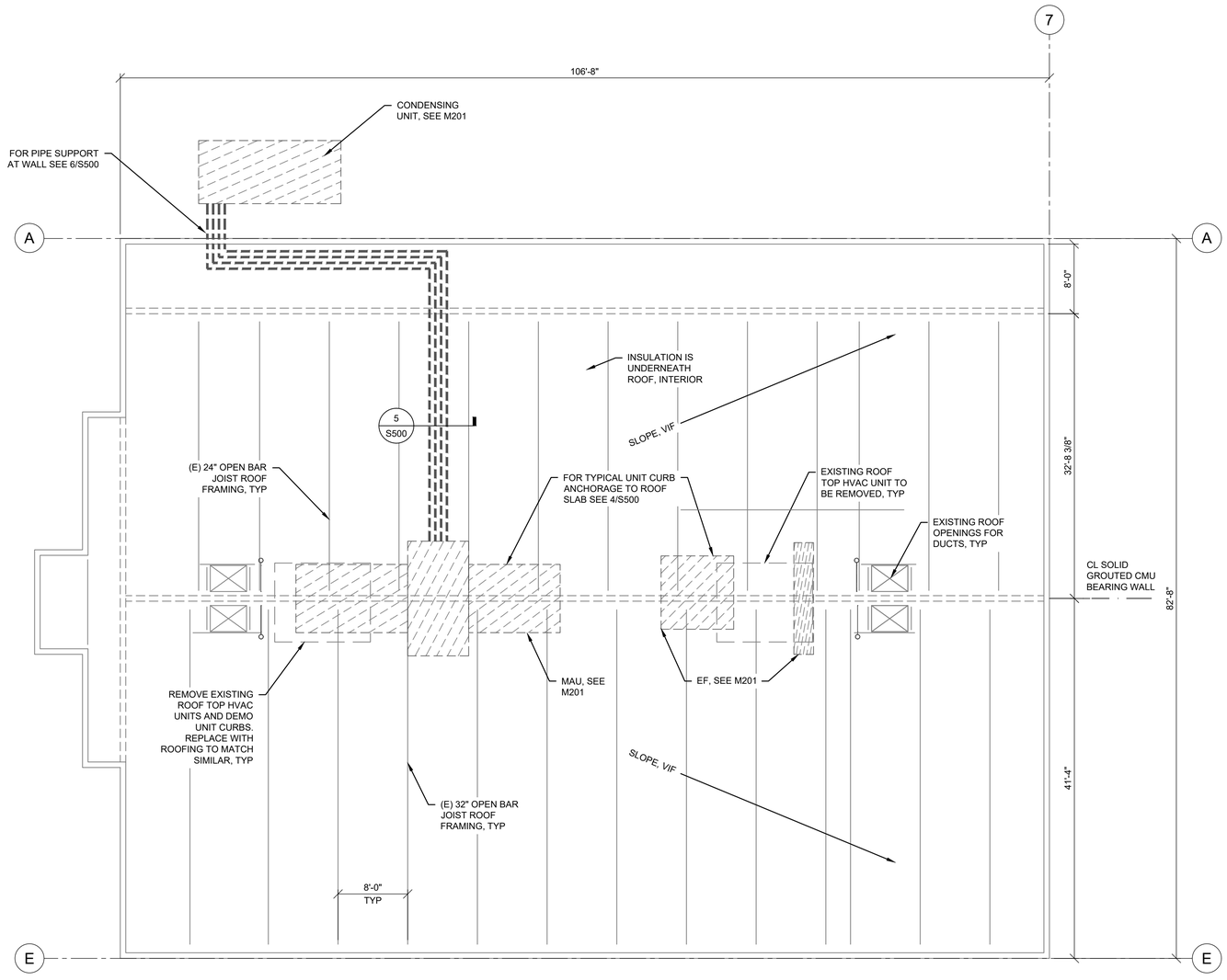

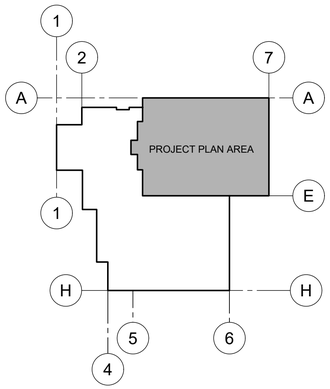

KEYPLAN

N

1 / S102

ROOF PLAN : 1/8" = 1'-0"

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15002
OREGON
JULY 25, 1990
PATRICK K. MURPHY
EXPIRES: 12/31/2022

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ROOF PLAN

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SHEET S102

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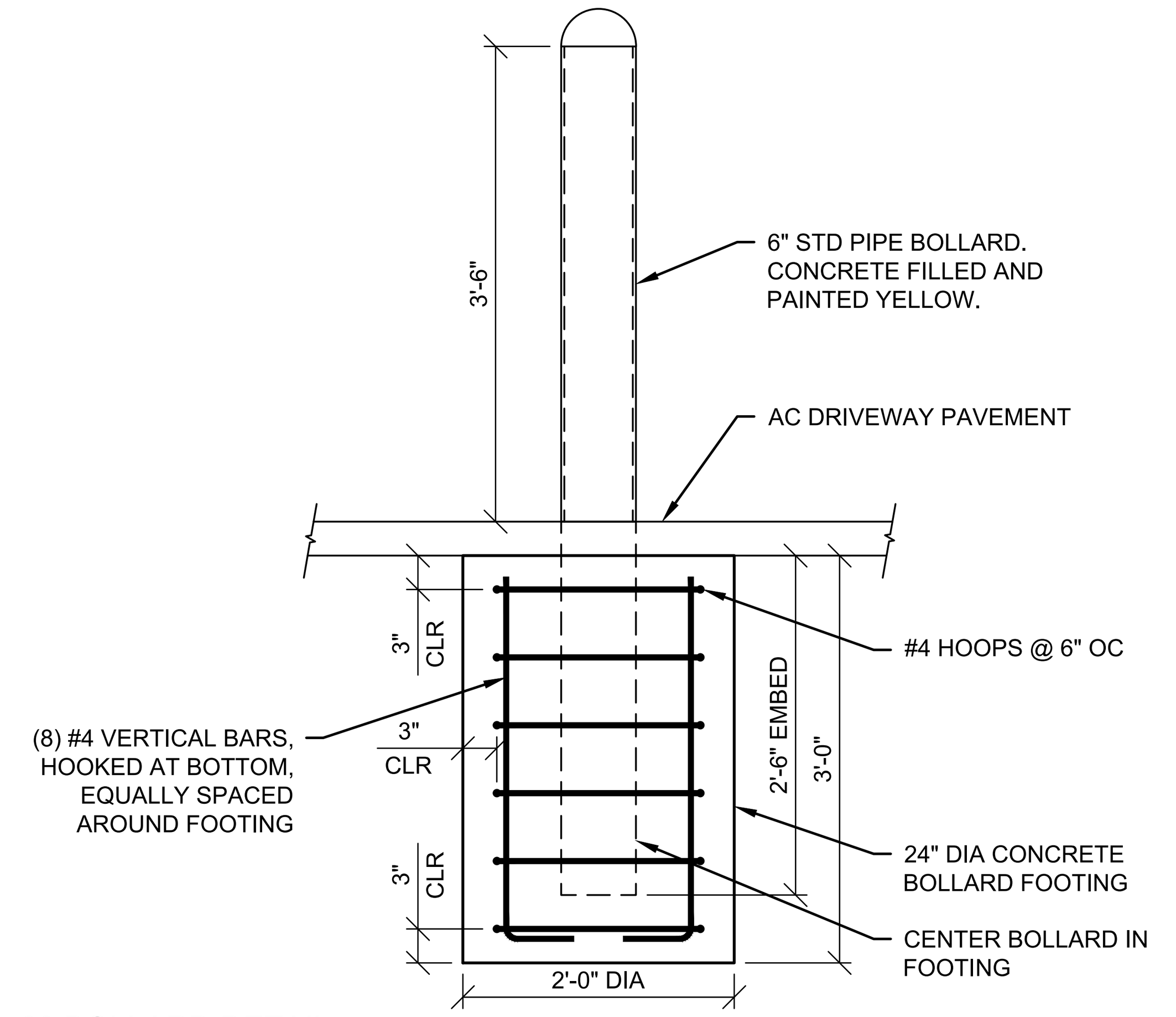
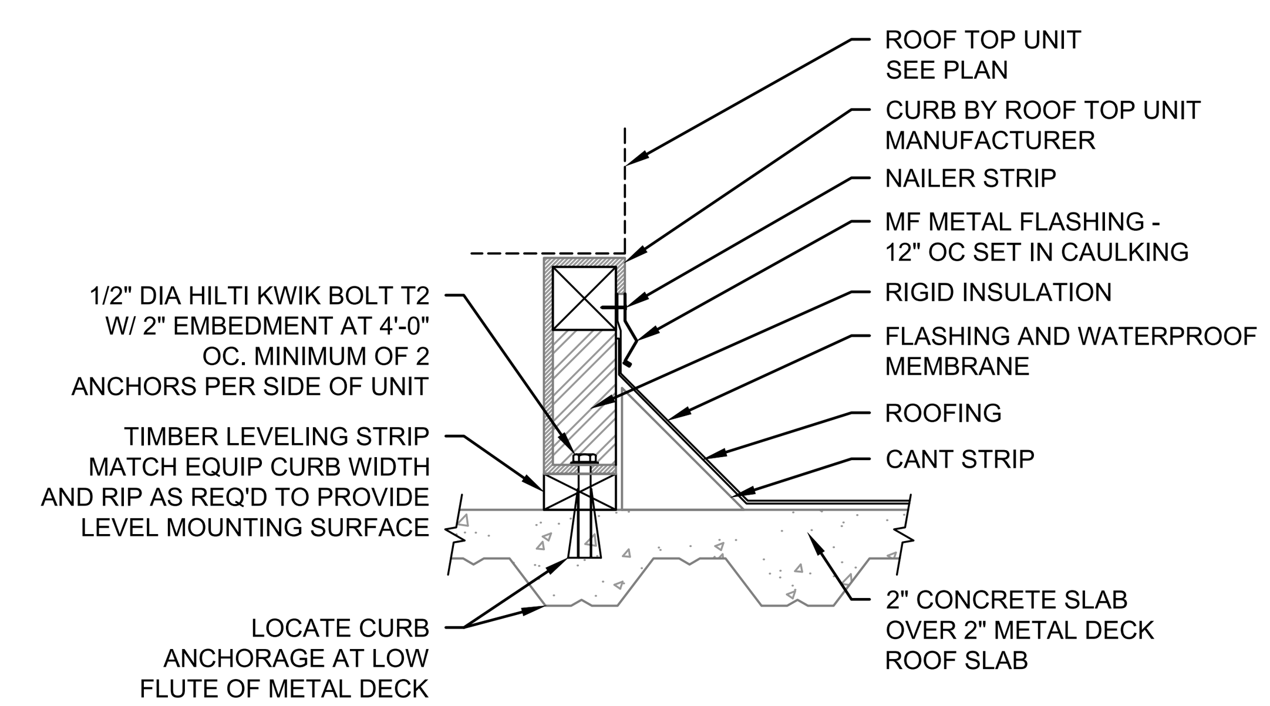
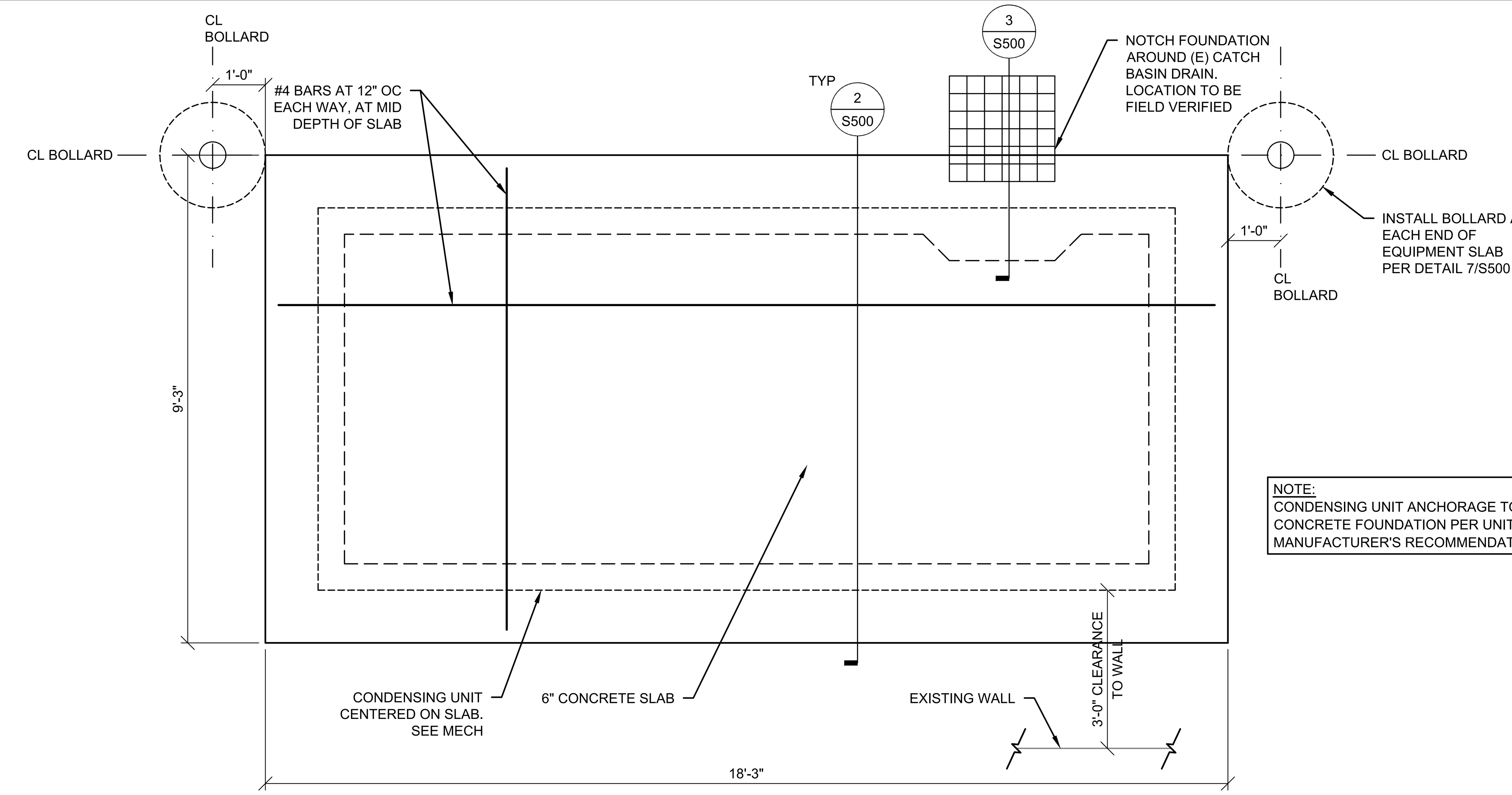


7 / S500 BOLLARD DETAIL
3/4" = 1'-0"



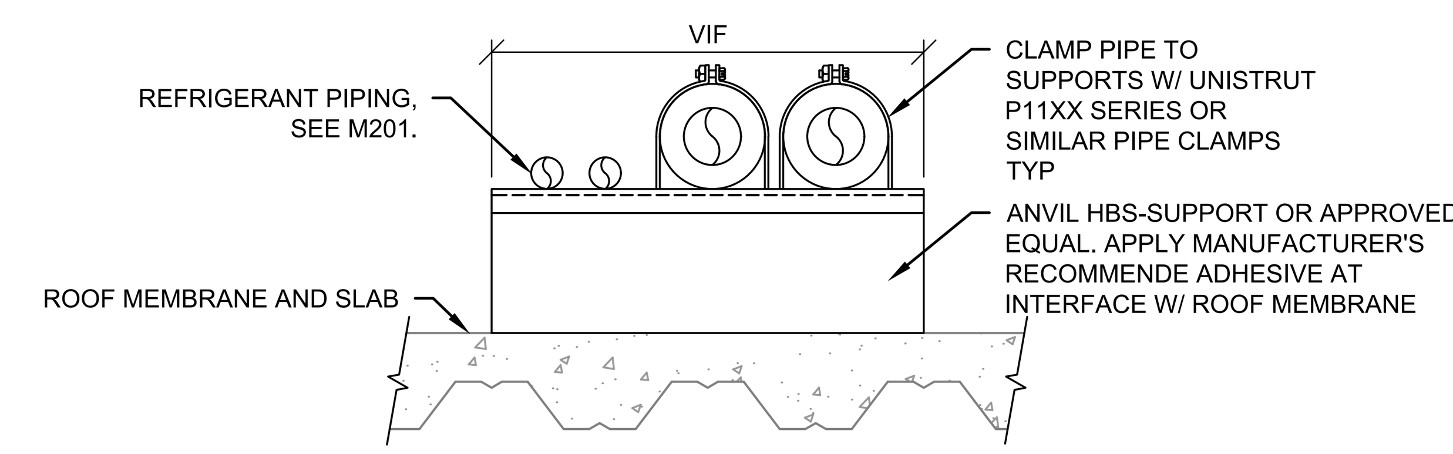
NOTE:
THIS DETAIL DENOTES GENERAL FLASHING AND CURB CONFIGURATION. VERIFY THE EXACT REQUIREMENTS OF THE EQUIPMENT CURBS. INSTALL CURBS IN ACCORDANCE WITH THE ROOFING MANUFACTURERS INSTRUCTIONS AND RESTORE EXISTING ROOF MEMBRANE SYSTEM TO PREEXISTING CONDITIONS.

4 / S500 ROOFTOP UNIT CURB DETAIL
1-1/2" = 1'-0"



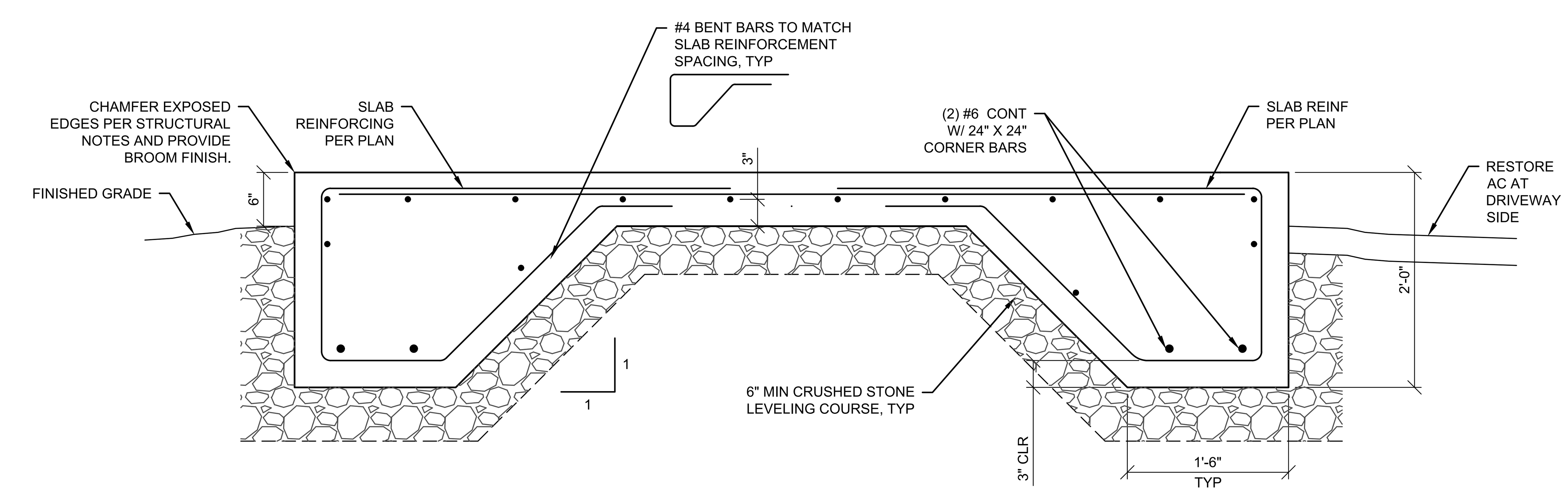
NOTE:
CONDENSING UNIT ANCHORAGE TO CONCRETE FOUNDATION PER UNIT MANUFACTURER'S RECOMMENDATIONS.

1 / S500 CONDENSING UNIT FOUNDATION PLAN
1/2" = 1'-0"

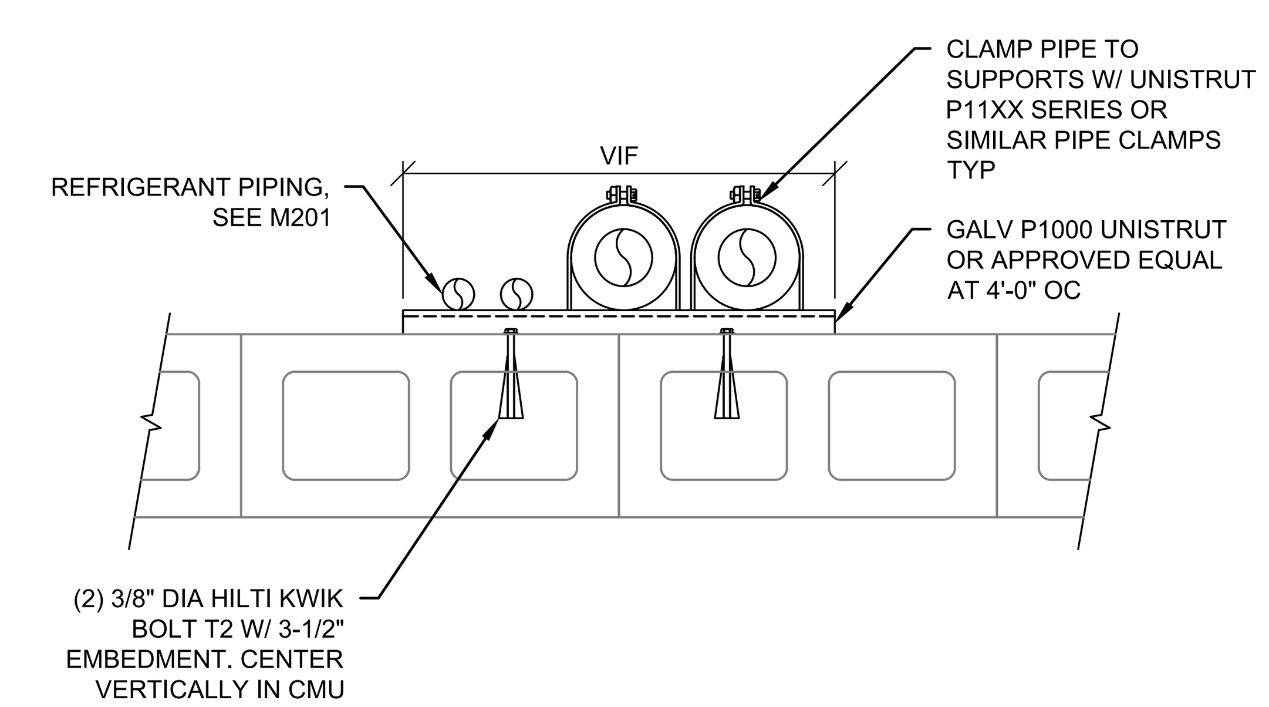


NOTE:
ROOF TOP PIPE SUPPORTS TO BE SPACED AT 4'-0" OC MAX. PIPE SUPPORTS TO BE LOCATED 2'-0" FROM END OF PIPE AND EACH SIDE OF CORNER OR OFFSET.

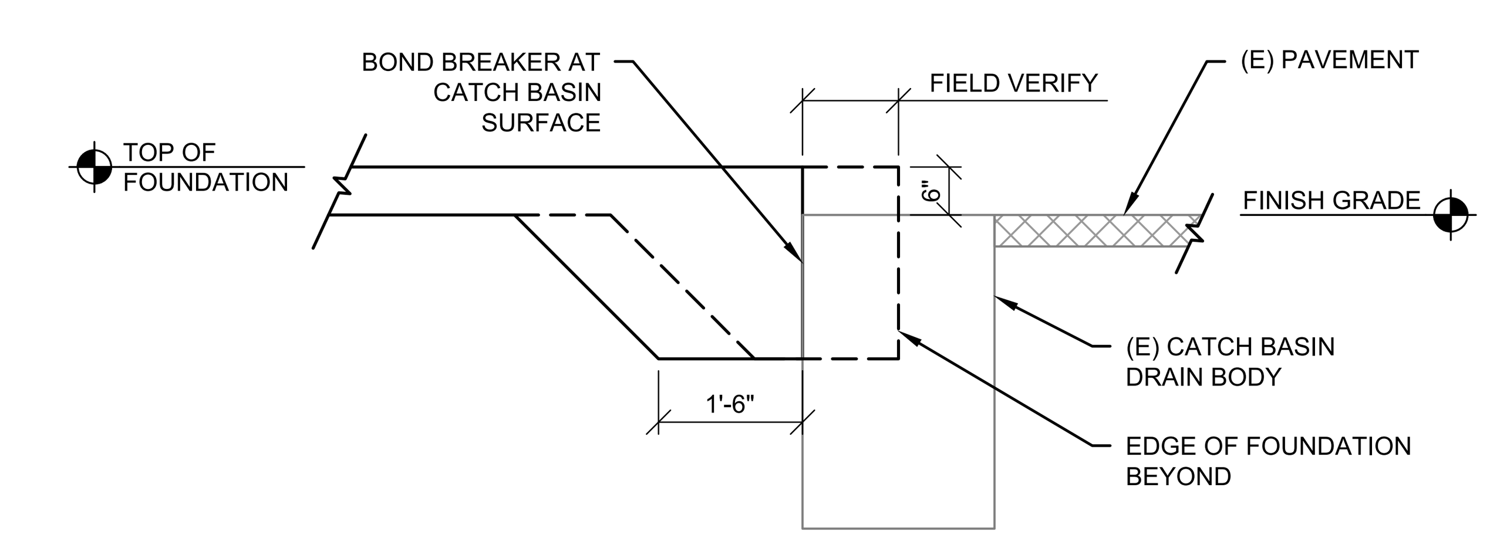
5 / S500 ROOF TOP PIPE SUPPORT
1-1/2" = 1'-0"



2 / S500 CONDENSING UNIT FOUNDATION
1" = 1'-0"



6 / S500 PIPE SUPPORT AT CMU WALL
1-1/2" = 1'-0"



3 / S500 FOUNDATION AT CATCH BASIN
1/2" = 1'-0"

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OREGON JULY 25, 1990 PATRICK K. MURPHY
EXPIRES: 12/31/2022

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0 1"
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DATE 03/02/22
SCALE AS INDICATED

DETAILS

JOB NUMBER 21857
DWG NAME: P21857_ST-DET
SHEET S500

Structural Calculations

for

Clackamas County PSTC AHU Replacement

Clackamas County Public Safety Center
12700 SE 82ND Ave
Clackamas, OR 97015

Prepared for

Clackamas County Department of Finance – Facilities Management

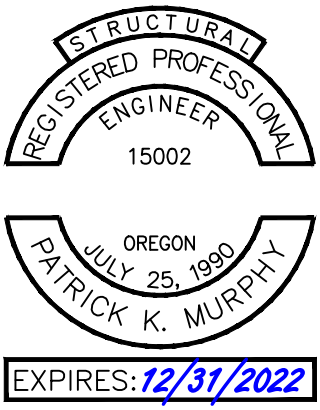
PACE Project Number 21857

March 2, 2022

Limitations

Engineer was retained in limited capacity for this project. Design is based upon information provided by the client, who is solely responsible for the accuracy of same. No responsibility and/or liability is assumed by, or is to be assigned to the engineer for items beyond that shown on these sheets.

43 sheets total including this cover sheet.



This Packet of Calculations is Null and Void if Signature above is not Original

PACE ENGINEERS, Inc.
4500 Kruse Way, Suite 250
Lake Oswego, OR 97035
(503) 597-3222 | Fax (503) 597-7655

Clackamas County PSTC AHU Replacement
PACE Job No. 21857

Structural Calculations
Table of Contents

MASTER DATA SHEET & DESCRIPTION

PACE Job No. 21857

Project Description:

The scope of this submittal includes professional engineering services for the following:

- Structural analysis of existing firing range structure, specifically the roof elements of the concrete over metal roof deck and open web bar joists.
- Foundation design for the HVAC condensing unit to be place on grade adajacent to firing range building.
- Miscellaneous pipe supports along roof and at exterior of firing range building wall.
- Seismic anchorage of HVAC units to concrete over metal roof deck.

Project Specifications:

Code: OSSC 2019
ASCE 7-16

Materials of Construction:

Concrete:
Slab on Grade Foundation $f_{c'}$ = 3 ksi

Structural Analysis Software Used:

RISA 3D

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CLACKAMAS COUNTY PUBLIC SAFETY TRAINING CENTER
ROOF TOP AHU REPLACEMENT

LOADINGS AT ROOF

DL_{SLAB} = 40 psf (2" METAL DECK + 2" CONCRETE TOPPING) SEE VECRO DECK CATALOG SHEET

DL_{AHU1} = 7309 # (EXISTING UNIT 1)

DL_{AHU2} = 2531 # (EXISTING UNIT 2)

SEE PAGE 13 FOR EXISTING ROOF PLAN WITH UNIT WEIGHTS

LL_{ROOF} = 20 psf & 300 # CONCENTRATED LOAD (OSSC SECTION 1607)

$SNOW_{ROOF}$ = 25 psf (NO DRIFT)

WIND

BASIC WIND SPEED = 97 mph (SEE ATC HAZARDS DATA SHEET)

EXPOSURE B

K_d = 0.85 (WIND DIRECTIONALITY, TABLE 26.6-1) COMPONENTS & CLADDING

K_e = 1.0 (ASCE 7-16 26.9)

K_z = 1.0 (ASCE 7-16 26.10.1)

K_{zt} = 1.0 (ASSUMED, ASCE 7-16 26.8.2)

K_d = 0.85 (ROOF TOP EQUIP, ASCE 7-16 TABLE 26.6-1)

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WIND PRESSURE

$$q_z = 0.00256 K_z K_{zt} K_d K_e V^2 \qquad \text{(ASCE 7-16 26.10-1)}$$

$$= 0.00256 (1.0)(1.0)(.85)(1.0)(97)^2$$
$$= 20.5 \text{ psf}$$

WIND FORCE

$$F_{WIND} = q_z G C_f \qquad \text{(ASCE 7-16, 29.4-1)}$$

$q_z = 20.5$ psf (ABOVE)

$G = 0.85$ (ASCE 7-16, 26.11)

$C_f = 1.4$ (CONSERVATIVE, ASCE 7-16 Fig. 29.4-1 $h/D = 7$, SQUARE, WIND NORMAL)

$$F_{WIND} = (20.5 \text{ psf})(.85)(1.4)$$
$$= 24.4 \text{ psf}$$

(PRESSURE TO BE APPLIED TO AHU CROSS SECTION, SEE PROCEEDING CALCS)

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SEISMIC

$$F_p = \frac{0.4\, a_p S_{DS} W_p \left(1 + 2\frac{z}{h}\right)}{\left(\frac{R_p}{I_p}\right)}$$ (ASCE 7-16, 13.3-1)

$S_{DS} = 0.697$ (SEE ATC HAZARDS DATA SHEET)

$a_p = 2.5$ (ASCE 7-16 TABLE 13.6-1) AIR-SIDE HVAC

$R_p = 6$

$I_p = 1.0$ (ASCE 7-16 13.1.3)

$\frac{z}{h} = 1.0$ (ROOF TOP UNIT)

$$F_p = \frac{0.4(2.5)(0.697) W_p \left(1 + 2(1)\right)}{\left(\frac{6}{1.0}\right)}$$

(LATERAL) $F_{PL} = 0.35 W_p$ (WEIGHT OF UNIT TO BE INCLUDED IN PROCEEDING CALCS)

(VERTICAL) $F_{PV} = 0.2 S_{DS} W_p$
$= 0.2(0.697) W_p$
$= 0.14 W_p$

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- CHECK ROOF DECK FOR EXISTING UNIT

WL_{AHU2} = 7309 # CONTROLS SLAB CHECK

ASSUME UNIT IS EQUALLY SUPPORTED AT ALL 4 SIDES OF CURB

$W_{LONG} = \frac{7309\#}{4}\left(\frac{1}{10'9"}\right)$ = 170 #/FT ALONG LONG SIDE OF UNIT 2 (SEE ATTACHED MARKUPS FOR GEOMETRY)

$W_{SHORT} = \frac{7309\#}{4}\left(\frac{1}{9'2"}\right)$ = 200 #/FT ALONG SHORT SIDE OF UNIT 2

ANALYZE 1' WIDTH OF SLAB BELOW CURB

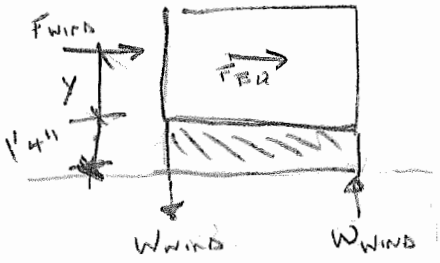
$W_{DL_{SLAB}} = 1.40\ psf\ (1') = 40\ \#/FT$

$W_{SNOW} = 25\ psf\ (1') = 25\ \#/FT$

P_{LL} = 300 # AT MID SPAN FOR MAX + MOMENT

INCLUDE WIND & SEISMIC CONTRIBUTION DUE TO OVERTURNING

SEE NEXT PAGE FOR LOADING DIAGRAM ON PLAN



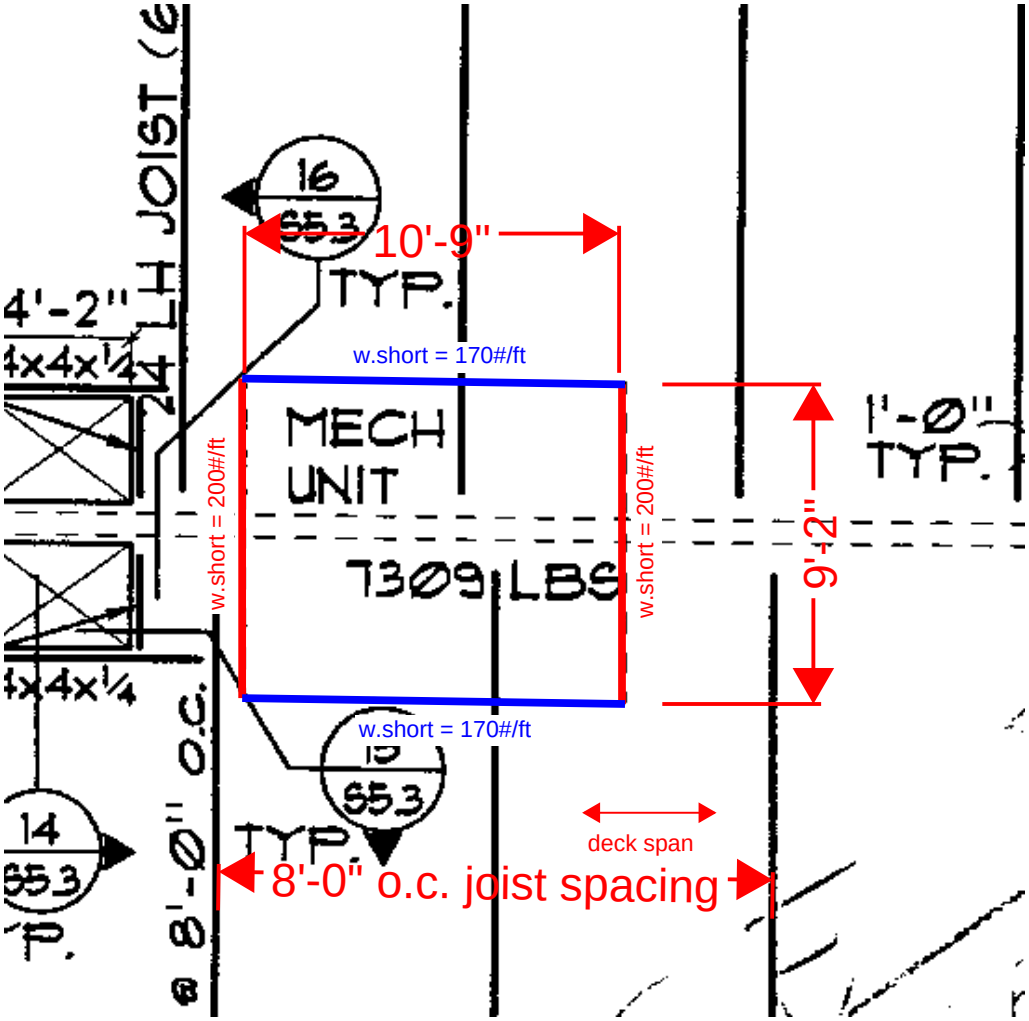
$M_{OT\ WIND} = F_{WIND}(AREA)\,y = 24.4\ psf\ (10.75' \times 5')(5'/2 + 1'4")$
$= 5027\ \#\text{-ft}$

$W_{WIND} = \frac{M_{OT\ WIND}}{9'-2"}\left(\frac{1}{10'9"}\right)$ = 51 #/FT ALONG LENGTH OF SHORT SIDE

$M_{OT\ EQ} = F_{P_L}\,DL_{UNIT\ 2}\,(y) = 0.35\,(7309\#)(5'/2 + 1'4")$
$= 9805\ \#\text{-FT}$

INCLUDES F_{PV}

$W_{EQ} = \frac{M_{OT\ EQ}}{9'-2"}\left(\frac{1}{10'9"}\right) + \frac{0.14\left(\frac{7309\#}{4}\right)}{10'-9"} = 123\ \#/FT$



EXISTING HVAC UNIT 1 LOADING ON ROOF PLAN

NOTE: THIS LOADING CONTROLS ROOF DECK AND OPEN-WEB JOIST ANALYSIS

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- SEE RISA OUTPUT FOR LRFD LOAD COMBOS PER ASCE 7-16 2.3.1

$M_{MAX}^{+} = 1.7$ K-FT

$M_{MAX}^{-} = -2.1$ K-FT

RISA LOADING INPUT ON PAGE 7
RISA RESULTS OUTPUT ON PAGE 8

FROM EXISTING DWG:

MINIMUM DECK GAGES ARE SHOWN ON PLANS AND ARE BASED ON 3-SPAN, UNSHORED CONDITIONS, AND MINIMUM PROPERTIES AS FOLLOWS:

ROOF & CEILING/FLOOR DECK:	I (IN4/FT)	S (IN3/FT)
2"-20 GAGE	0.423	0.361

- CHECK CAPACITY OF 2" DECK + 2" TOPPING W/ WIRE MESH (POSITIVE MOMENT)

2" DECK = 2" 20 GA DECK W/ MIN. $S_x = .361$ IN^3/FT OF DECK WIDTH

STEEL GRADE = ASTM A446 GRADE A = 45 KSI

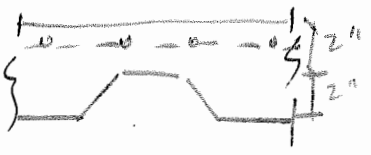
$\phi M_n = \phi F_y S_x = 0.9(45\text{ ksi})(.361\text{ in}^3/\text{FT}) = 14.62$ K-FT OKAY

OR

$\frac{45\text{ ksi}(.361\text{ in}^3/\text{FT})}{1.67\text{ F.S.}} = 9.7$ K-FT OKAY W/ ASD APPROACH

- CHECK NEGATIVE MOMENT CAPACITY OF DECK & MESH

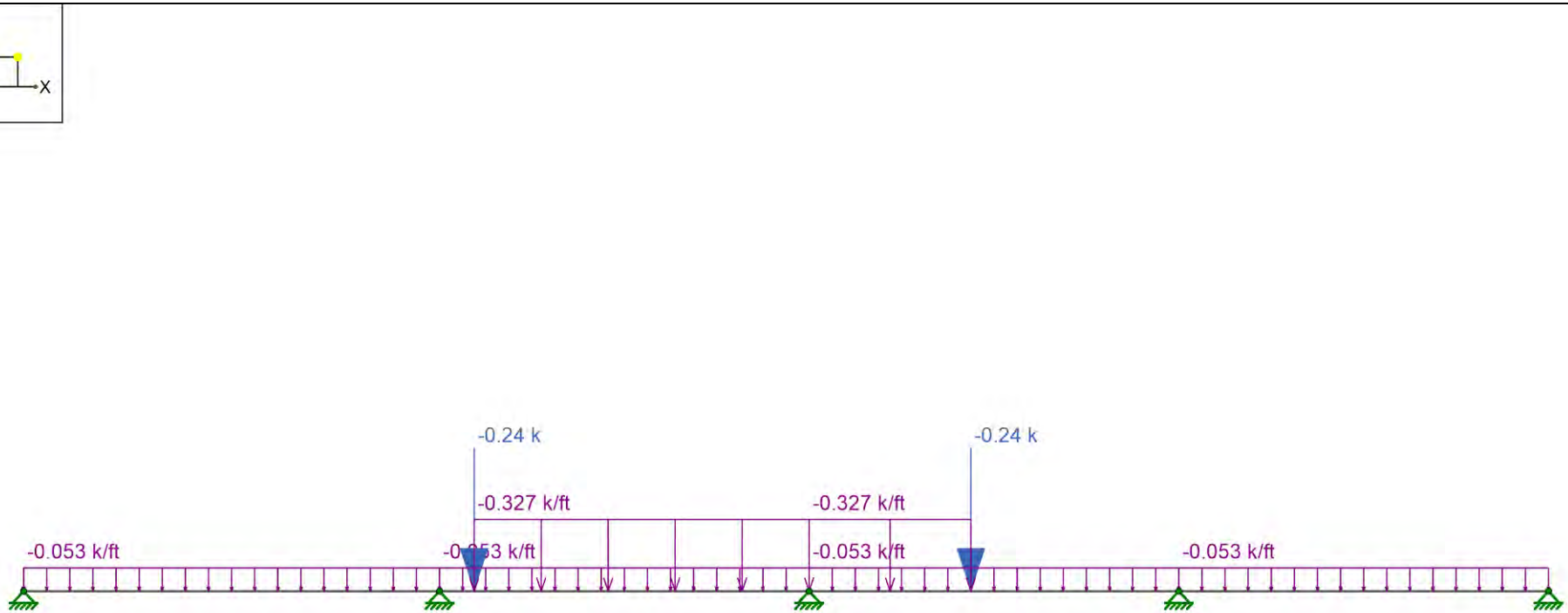
MESH = 6x6 W1.4xW1.4 @ ℄ OF TOPPING



$A_s = 0.028$ in^2/FT $F_y = 60$ ksi

$f'_c = 3$ ksi $b_w = 6$" (ASSUMED) $d = 3$"

$a = \frac{A_s F_y}{.85 f'_c b_w} = \frac{.028\text{ in}^2(60\text{ ksi})}{.85(3)(6")} = .11"$



Loads: LC 5, 1.2D+1.0EQ+0.2S

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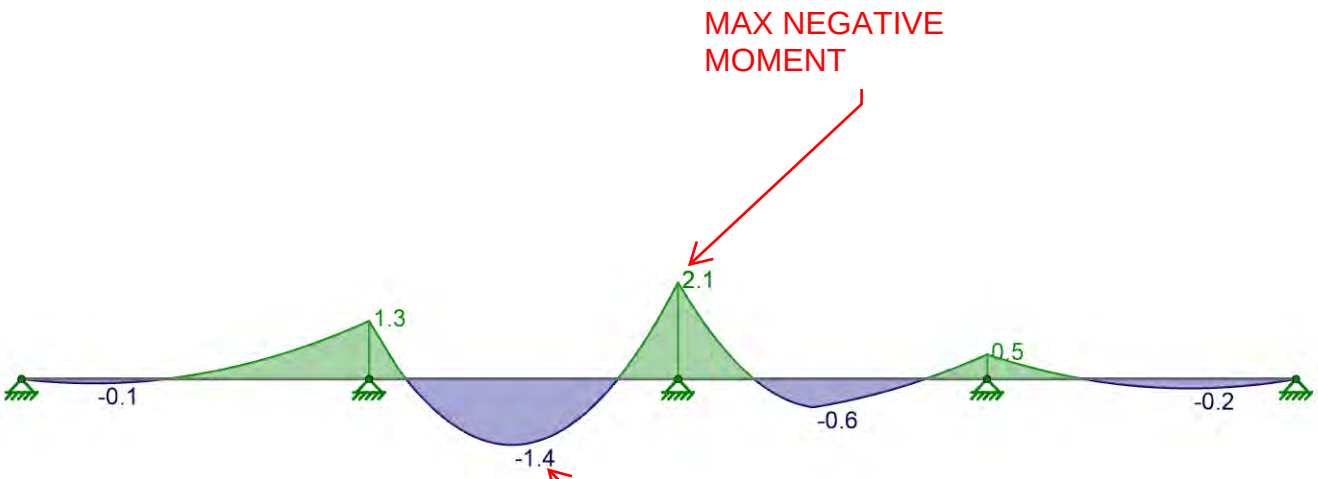
		Deck Check.r3d



Results for LC 5, 1.2D+1.0EQ+0.2S
Member z Bending Moments (kip-ft)

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- NEGATIVE MOMENT CAPACITY OF DECK

$$\phi M_n = \phi A_s F_y \left(d - \frac{a}{2}\right) = 0.9\left(.026\ in^2\right)\left(60\ ksi\right)\left(3'' - .11''/2\right)$$

$$= .37\ ^{K\text{-}FT}/_{FT} \text{ OF WIDTH OF DECK}$$

$$\text{WIDTH OF DECK TO REQ'D TO SUPPORT} = \frac{2.1\ ^{K\text{-}FT}}{.37\ ^{K\text{-}FT}} = 5.6'$$

- THERE IS SOME NEGATIVE MOMENT CAPACITY IN THE DECK, HOWEVER SMALL. UNIT STEEL CURB WILL RE-DISTRIBUTE LOAD/NEG. MOMENT TO CURB STEEL AND BE SUPPORTED BY SDIST (IS MUCH STIFFER AND

- PLENTY OF POSITIVE MOMENT CAPACITY IN METAL DECK

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- CHECK CMU WALL

DETERMINE TRIB AREA FOR WALL @ UNIT 1, ASSUME 3 JOISTS SPACINGS OF WALL WIDTH

$$A_{TRIB} = \left[\left(32'/2\right)_{\text{SPAN 1}} + \left(40'/2\right)_{\text{SPAN 2}}\right]\left(8' \times 3 \text{ SPACINGS}\right) = 864 \text{ FT}^2$$

$DL_{SLAB} = 40 \text{ psf}\ (864 \text{ ft}^2) = 34.6^{K}$

$LL_{ROOF} = 20 \text{ psf}\ (864 \text{ ft}^2) = 17.3^{K}$

$DL_{UNIT1} = 7.3^{K}$

CMU WALL THICKNESS = 8"
WALL HEIGHT = 15'0"

A_{STEEL} = #6 BARS @ 48" O.C. = .44 in²

$r_{WALL} = \frac{t_{WALL}}{\sqrt{12}} = \frac{8"}{\sqrt{12}} = 2.3$

$A_{NET\ WALL} = \left(3' \text{ spacings} \times 8' \times 12"\right)\left(t_{WALL}\right) = 288"(8") = 2304 \text{ in}^2$

WALL SLENDERNESS CHECK $\Rightarrow h/r = \frac{15" \times 12"}{2.3} = 78.2 < 99$

CHECK WALL SEGMENT FOR COMPRESSION (TMS 402-13, 9.3.4.1.1)

$$\phi P_n = \phi_b(0.8)\left(0.8 f'_m\left(A_N - A_S\right) + f_y A_{ST}\right)\left(1 - \left(\frac{h_A}{140r}\right)^2\right)$$

$\phi_b = 0.6$ (BEARING)

$f'_m = 2000$ psi (FROM EXISTING PLANS)

$f_y = 60$ ksi

$A_{St} = \frac{.44 \text{ in}^2}{4' \text{ O.C.}}\left(24' \text{ WIDTH}\right) = 2.64 \text{ in}^2$

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$$\phi P_n = 0.6(0.8)\left[0.8\left(2\ ksi\left(2304\ in^2 - 2.64\ in^2\right) + 60\ ksi\left(2.64\ in^2\right)\right)\right]\left(1 - \left(\frac{15' \times 12''}{140(2.3)}\right)^2\right)$$

$$= 0.6(0.8)(3841\ kips)(.69)$$

$$= 1272^{kip}$$

CMU WALL IS OKAY BY INSPECTION

$$P_{DL+LL} = 1.2(34.6^k + 7.3^k) + 1.6(17.3^k) = 78^k$$

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STRUCTURAL ANALYSIS - OPEN WEB JOIST

- EXISTING LOADING ON ROOF TRUSS

EXISTING LOADING: $W_{LL} = 200$ plf

$W_{TOTAL\ LL+DL} = 680$ plf

(From Existing Drawings, PAGE 12)

$L_{SPAN\ 1} = 33'$

$L_{SPAN\ 2} = 41'$

(SEE ATTACHED PRELIMINARY PLAN FOR ROOF TRUSS SPANS, PAGE 13)

- CONSERVATIVELY APPLY EXISTING UNITS IN ADDITION TO DESIGN LIVE LOAD

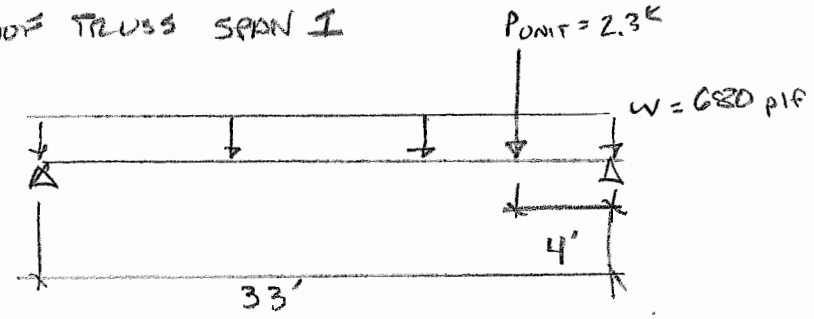
$W_{DL\ UNIT} = 170\ ^{\#}/_{FT}$

$W_{EQ} = 123\ ^{\#}/_{FT}$ ← CONSERVATIVELY INCLUDE OVERTURNING

$W_{TOTAL} = 293\ ^{\#}/_{FT}$

$P_{UNIT} = W_{TOTAL}\ (\text{TRIB WIDTH}) = 293\ ^{\#}/_{FT}\ (8'\ \text{C-C SPACING}) = 2.3^{K}$

ROOF TRUSS SPAN 1

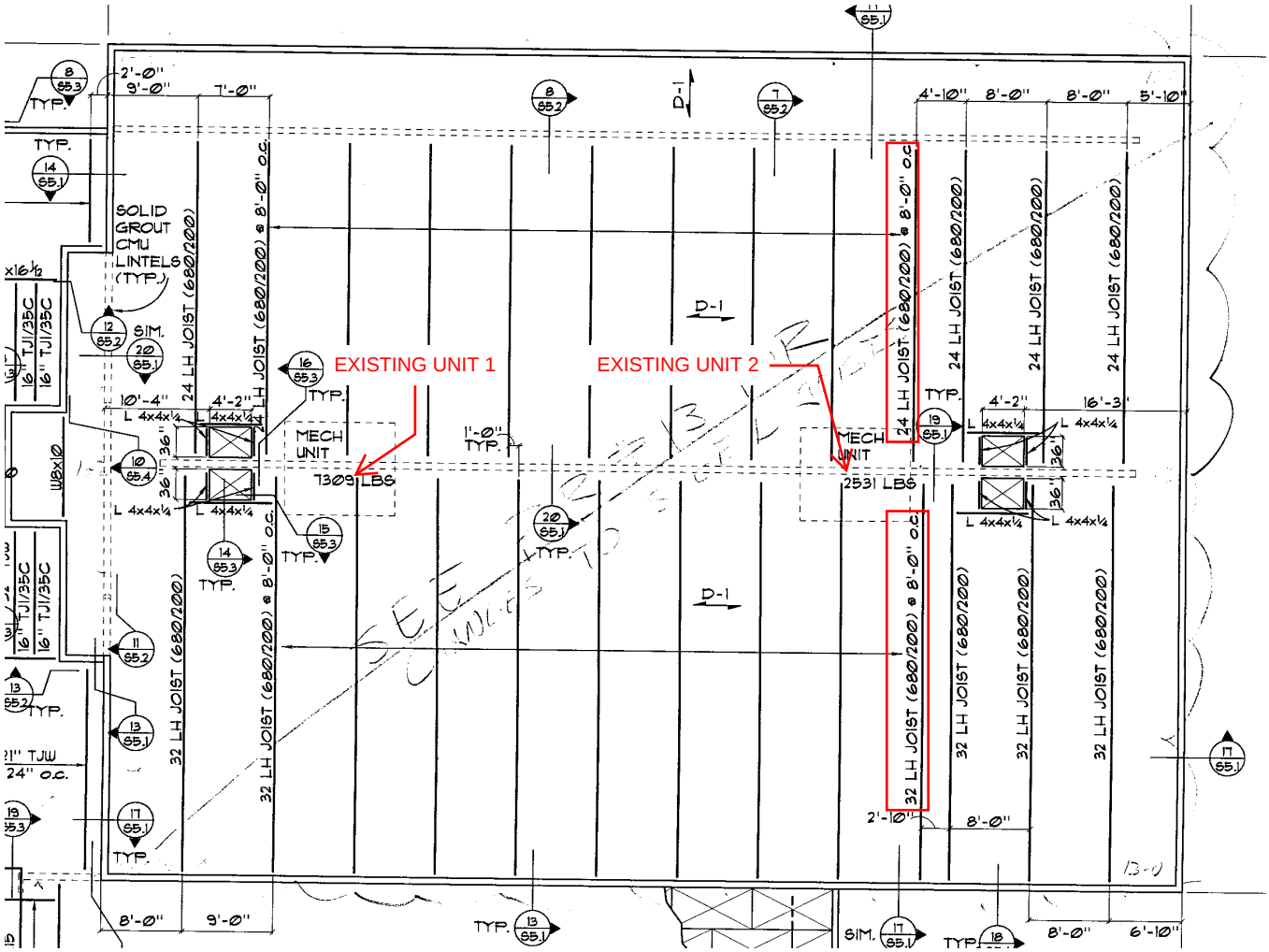


$M_{MAX\ @\ MID\ SPAN} = \frac{wl^2}{8} + \frac{Pxb}{l} = \frac{.680^{K/FT}(33')^2}{8} + \frac{2.3^{K}(33/2)(4')}{33}$

$= 97.2^{K\text{-}FT}$

$R_{MAX\ @\ END} = \frac{wl}{2} + \frac{Pa}{l} = \frac{.680^{K/FT}(33')}{2} + \frac{2.3^{K}(33'-4')}{33'}$

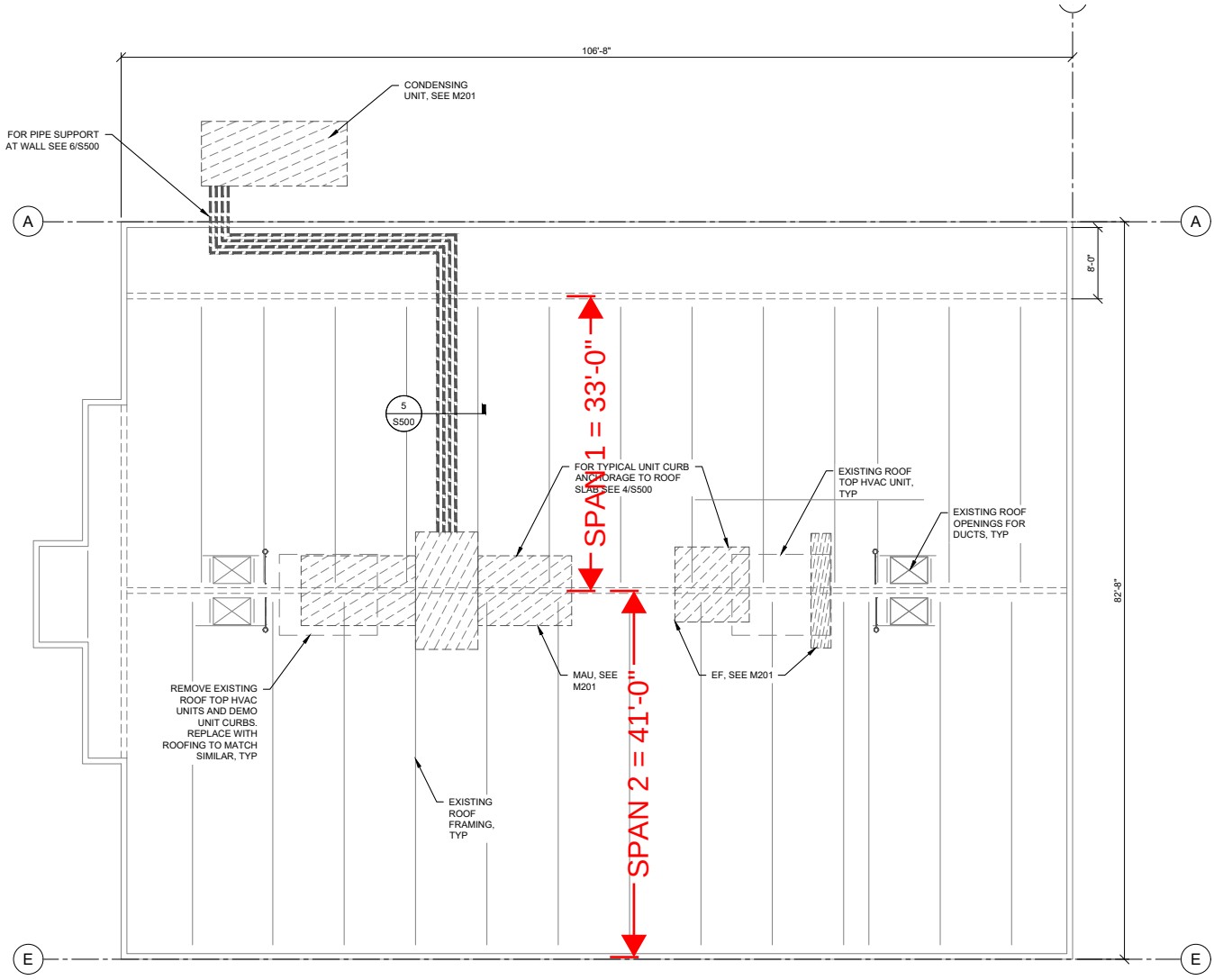
$= 13.2^{K}$



8. XXLH INDICATES DEPTH IN INCHES OF LH SERIES JOIST.

9. (XXX/YYY) XXX INDICATES TOTAL LOAD IN POUNDS PER LINEAL FOOT.
YYY INDICATES LIVE LOAD IN POUNDS PER LINEAL FOOT.

EXISTING ROOF PLAN WITH JOIST TYPE AND LOADING



PRELIMINARY ROOF PLAN

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ROOF TRUSS SPAN 2

SLIGHTLY OFF CENTERED ON WALL

$$M_{MAX\ @\ MID\ SPAN} = \frac{wl^2}{8} + \frac{P \times b}{l} = \frac{.680^{K/FT}(41)^2}{8} + \frac{2.3^K(41/2)(5')}{41}$$

$$= 148.6^{K\text{-}FT}$$

$$R_{MAX\ @\ END} = \frac{wl}{2} + \frac{Pa}{l} = \frac{.680^{K/FT}(41')}{2} + \frac{2.3^K(41'-5')}{41'}$$

$$= 16^K$$

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- CHECK NEW CONDENSING UNIT ON EXISTING STRUCTURE

P_{UNIT} = 11,000 lbs. (SEE ATTACHED IN APPENDIX A)

- ASSUME UNIT IS EQUALLY SUPPORTED ON 2 SIDES

(DEAD LOAD) $W_{LONG} = \frac{11^k}{2}\left(\frac{1}{19'10''}\right) = .28^{K/FT}$ ALONG CURB LENGTH

↑ CURB LENGTH

- INCLUDE EQ OVERTURNING FORCE

$M_{OTEQ} = F_{PL}(\Delta L_{UNIT})(y) = 0.35(11^k)\left(\frac{7'-10''}{2} + 1.5'_{\text{ASSUMED CURB}}\right)$

$= 20.8^{K-FT}$

$W_{EQ} = \frac{M_{OTEQ}}{7'-8''}\left(\frac{1}{19'10''}\right) + 0.14\left(\frac{11^k}{2}\right)\left(\frac{1}{19'-10''}\right) = .18^{K/FT}$ ALONG CURB

↑ F_{PV}

$W_{UNIT\,TOTAL} = 0.28^{K/FT} + 0.18^{K/FT} = .46^{K/FT}$

$P_{UNIT} = 8'$ C-C SPACING $(.46^{K/FT}) = 3.7^K$

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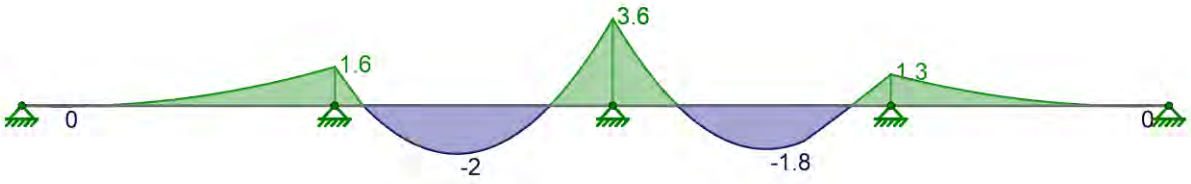
- SEE RISA OUTPUT FOR MOMENT DEMAND OF NEW UNIT ON CONCRETE SLAB OVER METAL DECK

$M_{max}^{+} = 2$ K-FT
$M_{max}^{-} = -3.6$ K-FT
} OKAY BY INSPECTION

SEE PAGE 18 FOR RISA 3D OUTPUT.



Results for LC 7, 1.2D+1.0EQ+0.2S_new
Member z Bending Moments (kip-ft)

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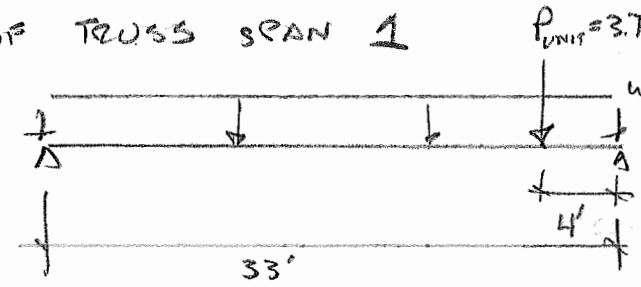
ROOF TRUSS SPAN 1



$$M_{MAX\ @\ MIDSPAN} = \frac{wl^2}{8} + \frac{Pxb}{l} = \frac{.680^{K/FT}(33')^2}{8} + \frac{3.7^K(33'/2)(4')}{33}$$

$$= 100^{K\text{-}FT}$$

% INCREASE FROM EXISTING = $\frac{100^{K\text{-}FT}}{97.2^{K\text{-}FT}}$ = 3% INCREASE

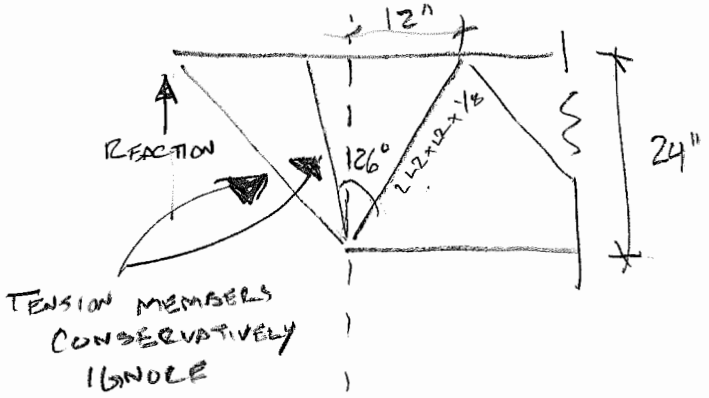
OKAY

$$R_{MAX\ @\ END} = \frac{wl}{2} + \frac{Pa}{l} = \frac{.680^{K/FT}(33')}{2} + \frac{3.7^K(33'-4')}{33'}$$

$$= 14.5^K$$

% INCREASE FROM EXISTING = $\frac{14.5^K}{13.2^K}$ = 9.8%

- CHECK AXIAL FORCE IN DIAGONAL TRUSS MEMBER CLOSEST TO BEARING
  - FOR CAPACITY TO RESIST REACTION FORCE $R_{MAX\ @\ END}$. IN COMPRESSION
- DIAGONAL MEMBERS = (2)L2×2×1/8 (TENSION OKAY BY INSPECTION)



$F_y = 0 = 14.5^K + \cos 26° F_{DIAG.}$

$F_{DIAG} = 16.1^K$

$L_b = 2.25'$ SAY 3' FOR CONSERVATISM

$\phi P_c = 24.3^K$ (ASC TABLE 4-8)

OKAY

SEE APPENDIX B FOR FIELD MEASUREMENTS

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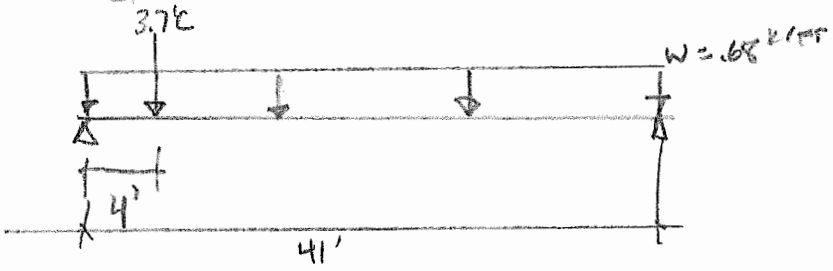
ROOF SPAN 2



$$M_{MAX\ @\ MID\ SPAN} = \frac{wl^2}{8} + \frac{P \times b}{l} = \frac{.68^{K/FT}(41')^2}{8} + \frac{3.7^K(41'\tfrac{1}{2})(4')}{41'}$$

$$= 150^{K\text{-}FT}$$

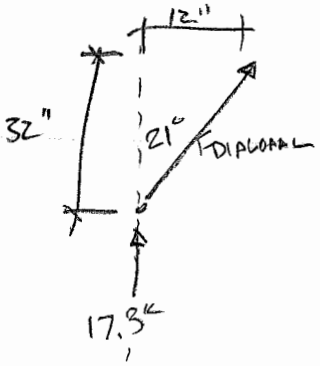
$$\%\ INCREASE = \frac{150^{K\text{-}FT}}{148.6^{K\text{-}FT}} = 1.1\%\ \underline{OK}$$

$$R_{MAX\ @\ END} = \frac{wl}{2} + \frac{Pa}{l} = \frac{.68^{K/FT}(41')}{2} + \frac{3.7^K(41'-4')}{41'}$$

$$= 17.3^K$$

$$\%\ INCREASE = \frac{17.3^K}{16^K} = 8\%$$

- CHECK AXIAL FORCE OF LAST COMPRESSION MEMBER IN TRUSS FOR CAPACITY TO RESIST $R_{MAX\ @\ END}$ (TENSION OKAY BY INSPECTION)
- SEE SPAN 1 CALC FOR SCHEMTIC OF TRUSS ANALYSIS CONSERVATIVELY IGNORE TENSION MEMBERS @ END WHICH WILL REDUCE DEMAND ON COMPRESSION STRUT.



$$F_y = 0 = 17.3 + \cos 21^\circ (F_{DIAG.})$$

$$F_{DIAG} = 18.5^K \qquad L_b = 2.8' \text{ SAY } 3'$$

$\phi P_c = 24.3^K$ OKAY
(AISC TABLE 4-8)

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JOB NO. 21857
JOB NAME Clackamas Co. PSTC
SHEET NO. 21 OF
CALCULATED BY GJM DATE 2/9/2022
CHECKED BY DATE

ROOF TOP UNIT / LRFD ANCHORAGE OF NEW UNIT (MAU)

- $\Delta L_{UNIT} = \frac{11^K}{\text{2 SUPPORTING SIDES}} \left(\frac{1}{\text{19'10" LENGTH}}\right) = .28^{K/FT}$

- $F_{p\ \text{LATERAL}} = 0.35 W_p = 0.35\left(.28^{K/FT}\right) = .098^{K/FT}$

- $F_{p\ \text{VERTICAL}} = 0.14\left(.28^{K/FT}\right) = .04^{K/FT}$

- TOTAL VERTICAL FORCE:

$$P = \Delta L_{UNIT} - F_{p\ \text{VERT}} - \frac{M_{\text{DTEQ}}}{7'-8"}\left(\frac{1}{19'10"}\right) = \text{[illegible]}$$

$$= .28^{K/FT} - .04^{K/FT} - \frac{20.8^{K-FT}}{7'-8"}\left(\frac{1}{19'10"}\right) = 0.1^{K/FT}$$ NO UPLIFT

- ASSUME ANCHORS @ 4' O.C.

Ω_0 OVERSTRENGTH

$$P_L = .098^{K/FT}(4') = .4^K(2) = .8^K$$

$$P_V = .1^{K/FT}(4') = .4^K \text{ (DOWN)}$$

USE ½" ϕ HILTI KWIK BOLT TZ w/ 2" EMBED
OKAY BY INSPECTION

SEE FOLLOWING SHEETS 22 - 30 FOR HILTI OUTPUT

Hilti PROFIS Engineering 3.0.75

www.hilti.com

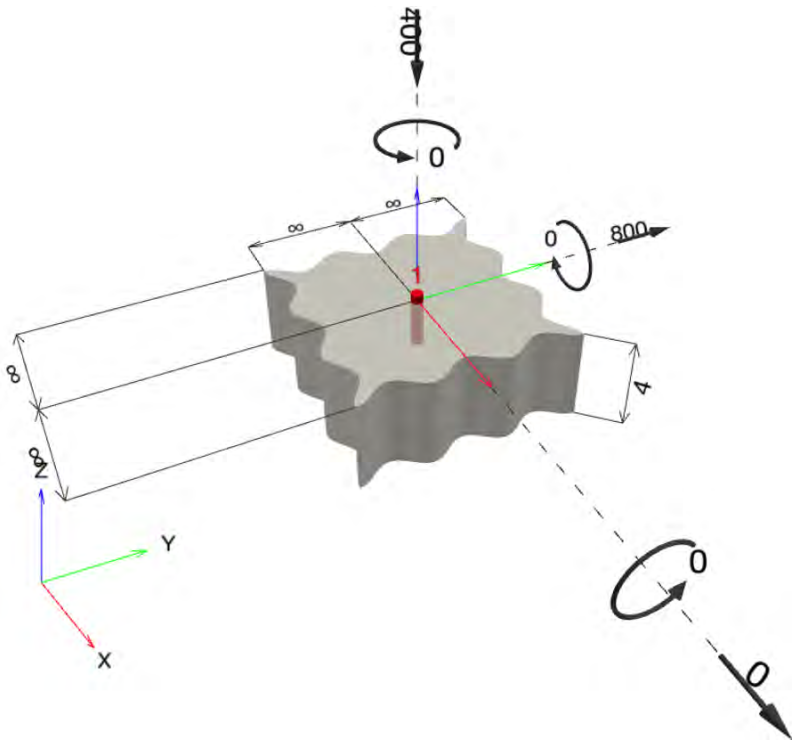
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2022 (1)	Date:	2/14/2022
Fastening point:			

Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - CS 1/2 (2) hnom2**
Item number:	2210254 KB-TZ2 1/2x3 3/4
Effective embedment depth:	h_{ef} = 2.000 in., h_{nom} = 2.500 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-4266
Issued I Valid:	7/1/2021 | 12/1/2021
Proof:	Design Method ACI 318 / AC193
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 3000, f_c' = 3,000 psi; h = 4.000 in.
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	no

Geometry [in.] & Loading [lb, in.lb]



Hilti PROFIS Engineering 3.0.75

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Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2022 (1)	Date:	2/14/2022
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = -400; V_x = 0; V_y = 800; M_x = 0; M_y = 0; M_z = 0;	no	36

2 Load case/Resulting anchor forces

Anchor reactions [lb]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	-400	800	0	800

max. concrete compressive strain: - [‰]
max. concrete compressive stress: - [psi]
resulting tension force in (x/y)=(0.000/0.000): 0 [lb]
resulting compression force in (x/y)=(0.000/0.000): 0 [lb]

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	-400	8,433	5	OK
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (anchors in tension)

Hilti PROFIS Engineering 3.0.75

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Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2022 (1)	Date:	2/14/2022
Fastening point:			

3.1 Steel Strength

N_{sa} = ESR value — refer to ICC-ES ESR-4266

$\phi\ N_{sa} \geq N_{ua}$ — ACI 318-08 Eq. (D-1)

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.10	114,004

Calculations

N_{sa} [lb]
11,244

Results

N_{sa} [lb]	ϕ_{steel}	$\phi\ N_{sa}$ [lb]	N_{ua} [lb]
11,244	0.750	8,433	-400

The steel proof was done for the highest absolute force per anchor - in this case compression loading. Please be aware that buckling should be verified separately

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2022 (1)	Date:	2/14/2022
Fastening point:			

4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	800	3,599	23	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	800	2,277	36	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

V_{sa} = ESR value refer to ICC-ES ESR-4266
ϕ $V_{steel} \geq V_{ua}$ ACI 318-08 Eq. (D-2)

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]	$\alpha_{V,seis}$
0.10	114,004	1.000

Calculations

V_{sa} [lb]
5,537

Results

V_{sa} [lb]	ϕ_{steel}	ϕ V_{sa} [lb]	V_{ua} [lb]
5,537	0.650	3,599	800

Company:		Page:	5
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2022 (1)	Date:	2/14/2022
Fastening point:			

4.2 Pryout Strength

$V_{cp} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \right]$ ACI 318-08 Eq. (D-30)

$\phi V_{cp} \geq V_{ua}$ ACI 318-08 Eq. (D-2)

A_{Nc} see ACI 318-08, Part D.5.2.1, Fig. RD.5.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-08 Eq. (D-6)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-08 Eq. (D-11)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-08 Eq. (D-13)

$N_b = k_c \lambda \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-08 Eq. (D-7)

Variables

k_{cp}	h_{ef} [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
1	2.000	∞	1.000

c_{ac} [in.]	k_c	λ	f'_c [psi]
5.500	21	1	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
36.00	36.00	1.000	1.000	3,253

Results

V_{cp} [lb]	$\phi_{concrete}$	ϕV_{cp} [lb]	V_{ua} [lb]
3,253	0.700	2,277	800

5 Combined tension and shear loads

β_N	β_V	ζ	Utilization $\beta_{N,V}$ [%]	Status
0.047	0.351	5/3	19	OK

$\beta_{NV} = \beta_N^{\zeta} + \beta_V^{\zeta} <= 1$

Company:		Page:	6
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2022 (1)	Date:	2/14/2022
Fastening point:			

6 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/
- Attention! In case of compressive anchor forces a buckling check as well as the proof of the local load transfer into and within the base material (incl. punching) has to be done separately.

Fastening meets the design criteria!

Company:		Page:	7
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2022 (1)	Date:	2/14/2022
Fastening point:			

7 Installation data

Anchor type and diameter: Kwik Bolt TZ2 - CS 1/2 (2) hnom2

Profile: -

Item number: 2210254 KB-TZ2 1/2x3 3/4

Hole diameter in the fixture: -

Maximum installation torque: 602 in.lb

Plate thickness (input): -

Hole diameter in the base material: 0.500 in.

Hole depth in the base material: 2.750 in.

Drilling method: Hammer drilled

Minimum thickness of the base material: 4.000 in.

Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Hilti KB-TZ2 stud anchor with 2.5 in embedment, 1/2 (2) hnom2, Carbon steel, installation per ESR-4266

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Manual blow-out pump	• Torque controlled cordless impact tool • Torque wrench • Hammer

Coordinates Anchor in.

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.000	0.000	-	-	-	-

Company:		Page:	8
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 9, 2022 (1)	Date:	2/14/2022
Fastening point:			

8 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

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JOB NO. 21857
JOB NAME CLACKAMAS CO. PSTC
SHEET NO. 30 OF
CALCULATED BY GSM DATE 2/9/2022
CHECKED BY DATE

- CONDENSING UNIT FOUNDATION

UNIT WEIGHT = 3.4 KIPS

$A_{FOUNDATION}$ = 18.25' × 9.25' = 169 ft²

$P_{FOUNDATION}$ = [(6" THICK × 9'3" WIDTH) + (1'-6" × 1'-6" × 2 THICKENED EDGES)] × 18.25' LONG × .150 KIPS/FT³

= 25 K

$\sigma_{bearing} = \frac{3.4^K + 25^K}{169\ ft^2}$ = .170 ksf << 1.5 ksf bearing

OKAY BY INSPECTION

OVERTURNING & SLIDING NOT A CONCERN, OK BY INSPECTION

PROVIDE $A_{S\,MIN}$ IN 6" THICK SLAB PER FOOT OF LENGTH/WIDTH

$A_{S\,MIN}$ = .0018(6" × 12") = .13 in²/FT REQ'D

PROVIDE #4 @ 12" O.C. EACH WAY

$A_{S\,PROVIDED}$ = .20 in²/FT OK

Hazards by Location

APPENDIX A - LOADING DATA

Search Information

Address: 12700 SE 82nd Ave, Portland, OR 97222, USA

Coordinates: 45.4307739, -122.5787831

Elevation: 136 ft

Timestamp: 2021-12-28T21:03:58.539Z

Hazard Type: Wind

ASCE 7-16

MRI 10-Year	66	mph
MRI 25-Year	72	mph
MRI 50-Year	77	mph
MRI 100-Year	82	mph
Risk Category I	91	mph
Risk Category II	97	mph
Risk Category III	103	mph
Risk Category IV	107	mph

ASCE 7-10

MRI 10-Year — Special Region — mph

You are in a special wind region. Please contact the Authority Having Jurisdiction.

MRI 25-Year — Special Region — mph

You are in a special wind region. Please contact the Authority Having Jurisdiction.

MRI 50-Year — Special Region — mph

You are in a special wind region. Please contact the Authority Having Jurisdiction.

MRI 100-Year — Special Region — mph

You are in a special wind region. Please contact the Authority Having Jurisdiction.

Risk Category I — Special Region — mph

You are in a special wind region. Please contact the Authority Having Jurisdiction.

Risk Category II — Special Region — mph

You are in a special wind region. Please contact the Authority Having

ASCE 7-05

ASCE 7-05 Wind Speed — Special Region — mph

You are in a special wind region. Please contact the Authority Having Jurisdiction.

Jurisdiction.

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Risk Category III-IV	⚠ Special Region	mph

You are in a special wind region. Please contact the Authority Having Jurisdiction.

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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Hazards by Location

Search Information

Address: 12700 SE 82nd Ave, Portland, OR 97222, USA

Coordinates: 45.4307739, -122.5787831

Elevation: 136 ft

Timestamp: 2021-12-28T21:04:59.558Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default

Basic Parameters

Name	Value	Description
S_S	0.871	MCE_R ground motion (period=0.2s)
S_1	0.381	MCE_R ground motion (period=1.0s)
S_{MS}	1.046	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.697	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.883	Coefficient of risk (0.2s)
CR_1	0.866	Coefficient of risk (1.0s)
PGA	0.395	MCE_G peak ground acceleration
F_{PGA}	1.205	Site amplification factor at PGA
PGA_M	0.476	Site modified peak ground acceleration

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T_L	16	Long-period transition period (s)
SsRT	0.871	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.987	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.381	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.44	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.548	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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PLW2™ or W2 FORMLOK™

- **4 in. TOTAL SLAB DEPTH**
- **Normal Weight Concrete**

Maximum Unshored Clear Span (ft-in.)

Deck Gage	Number of Deck Spans		
	1	2	3
22	7'-9"	9'-0"	9'-2"
21	8'-6"	9'-8"	10'-0"
20	9'-3"	10'-3"	10'-8"
19	10'-0"	11'-5"	11'-10"
18	10'-5"	12'-3"	12'-5"
16	11'-2"	13'-11"	13'-1"

Shoring is required for spans greater than those shown above. See Footnote 1 on page 51 for required bearing.

Concrete Properties

Density (pcf)	Uniform Weight (psf)	Uniform Volume ($yd^3/100\ ft^2$)	Compressive Strength, f'_c (psi)
145	36.3	0.926	3000

Notes:
1. Volumes and weights do not include allowance for deflection.
2. Weights are for concrete only and do not include weight of steel deck.
3. Total slab depth is nominal depth from top of concrete to bottom of steel deck.

CONSERVATIVELY ASSUME 40PSF FOR TOTAL DECK WEIGHT PSF

Allowable Superimposed Loads (psf)

Deck Gage	Number of Deck Spans	Span (ft-in.)														
		6'-0"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"	11'-6"	12'-0"	12'-6"	13'-0"	14'-0"
22	1	337	261	232	172	152	135	120	107	96	86	78	70	63	57	46
	2	337	261	232	209	189	171	120	107	96	86	78	70	63	57	46
	3	337	261	232	209	189	171	120	107	96	86	78	70	63	57	46
21	1	377	292	260	234	211	155	139	125	112	101	91	82	75	68	55
	2	377	292	260	234	211	192	175	125	112	101	91	82	75	68	55
	3	377	292	260	234	211	192	175	161	112	101	91	82	75	68	55
20	1	400	324	288	259	234	213	158	142	128	116	105	95	86	79	65
	2	400	324	288	259	234	213	195	179	128	116	105	95	86	79	65
	3	400	324	288	259	234	213	195	179	165	116	105	95	86	79	65
19	1	400	389	347	311	275	242	214	190	161	146	133	121	110	99	81
	2	400	389	347	311	275	242	214	190	169	152	133	121	110	99	81
	3	400	389	347	311	275	242	214	190	169	152	136	121	110	99	81
18	1	400	400	386	335	293	258	229	203	181	162	146	131	118	105	84
	2	400	400	386	335	293	258	229	203	181	162	146	131	118	105	84
	3	400	400	386	335	293	258	229	203	181	162	146	131	118	105	84
16	1	400	400	396	356	322	292	261	233	208	187	157	143	131	116	93
	2	400	400	396	356	322	292	261	233	208	187	168	148	131	116	93
	3	400	400	396	356	322	292	261	233	208	187	168	148	131	116	93

See footnotes on page 51.

Shoring required in shaded areas to right of heavy line.

Allowable Diaphragm Shear Strengths, q (plf) and Flexibility Factors, F (in./lb. x 10^6)

Attachment Pattern	Deck Gage		Span (ft-in.)														
			6'-0"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"	11'-6"	12'-0"	12'-6"	13'-0"	14'-0"
36/3	**22**	q	1674	1635	1619	1606	1594	1583	1573	1565	1557	1550	1543	1537	1532	1527	1518
	21	q	1680	1637	1620	1605	1592	1580	1570	1560	1552	1544	1537	1530	1524	1519	1509
	20	q	1689	1643	1624	1608	1593	1580	1569	1559	1549	1541	1533	1526	1519	1513	1503
	19	q	1714	1659	1637	1618	1602	1587	1573	1561	1550	1540	1531	1523	1515	1508	1496
	18	q	1739	1678	1653	1632	1613	1596	1581	1568	1556	1545	1534	1525	1517	1509	1495
	16	q	1809	1733	1702	1675	1652	1631	1612	1595	1580	1566	1553	1541	1531	1521	1503
36/4	**22**	q	1834	1762	1734	1708	1686	1667	1649	1633	1619	1606	1594	1583	1573	1563	1547
	21	q	1867	1788	1756	1729	1704	1683	1663	1646	1630	1616	1602	1590	1579	1569	1551
	20	q	1902	1816	1781	1751	1725	1701	1680	1661	1643	1628	1613	1600	1588	1577	1557
	19	q	1977	1877	1836	1801	1770	1742	1718	1696	1675	1657	1640	1625	1611	1598	1575
	18	q	2044	1931	1886	1847	1812	1781	1753	1729	1706	1686	1667	1650	1634	1619	1593
	16	q	2212	2071	2015	1965	1922	1883	1848	1817	1789	1763	1740	1718	1698	1680	1647

See footnotes on page 51.

Geoff May

From: Geoff May
Sent: Wednesday, February 9, 2022 3:57 PM
To: Kerns, Chuck
Subject: RE: PSTC dimensions

Chuck,

Thanks for grabbing this one last measure. It was a huge help. I believe we have all we need.

Enjoy your vacation and when you get back, you'll have a bid package of drawings and specs waiting for you.

Thanks

Geoff May, PE
Structural Engineer
4500 Kruse Way | Suite 250
Lake Oswego OR 97035
p. 503.597.3222

PACE
An Engineering Services Company

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Voted Zweig Best Places to Work and PSBJ Top 100 Fastest Growing Firms in the Northwest

From: Kerns, Chuck <ChuckKer@clackamas.us>
Sent: Wednesday, February 9, 2022 6:08 AM
To: Geoff May <GeoffM@paceengrs.com>
Subject: RE: PSTC dimensions

Geoff,

The diagonals close to the walls are 2"x2"x1/8" thick. The ones closer to the center are 1.5"x1.5"x1/8" thick. You can add Paullan@clackamas.us onto the e-mail list, he is the Supervisor for our department. Thanks for your work on this! If you have any other questions or need of measurements, reach out to me before 5. Have a good day.

Chuck Kerns
Building Systems Coordinator
CLACKAMAS COUNTY DEPARTMENT OF FINANCE | Facilities Management
1710 Red Soils Ct. Suite 200, Oregon City, OR 97045,
office 503.557-6420, mobile 503.780-4864
www.clackamas.us

From: Geoff May <GeoffM@paceengrs.com>
Sent: Tuesday, February 8, 2022 9:59 AM
To: Kerns, Chuck <ChuckKer@clackamas.us>
Subject: RE: PSTC dimensions

Chuck,

Thanks a lot for these measurements. This really helpful and will let us complete our work without needing to chase down the joist manufacturer.

Would you be able to grab one more measure of the diagonal members. If you can get measurements of the diagonals closer to the wall that would be best. See attached.

We are hoping to have our design drawings, calculations, and specifications by Friday the 11th, it may slip into earlier the following week. Is there somebody else I should send this to, while you are on vacation?

Thanks and enjoy your vacation.

Geoff May, PE
Structural Engineer
4500 Kruse Way | Suite 250
Lake Oswego OR 97035
p. 503.597.3222

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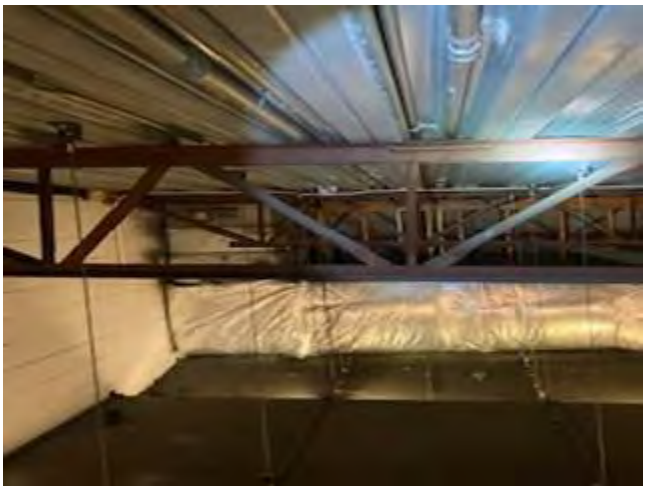
From: Kerns, Chuck <ChuckKer@clackamas.us>
Sent: Tuesday, February 8, 2022 8:46 AM
To: Geoff May <GeoffM@paceengrs.com>
Subject: FW: PSTC

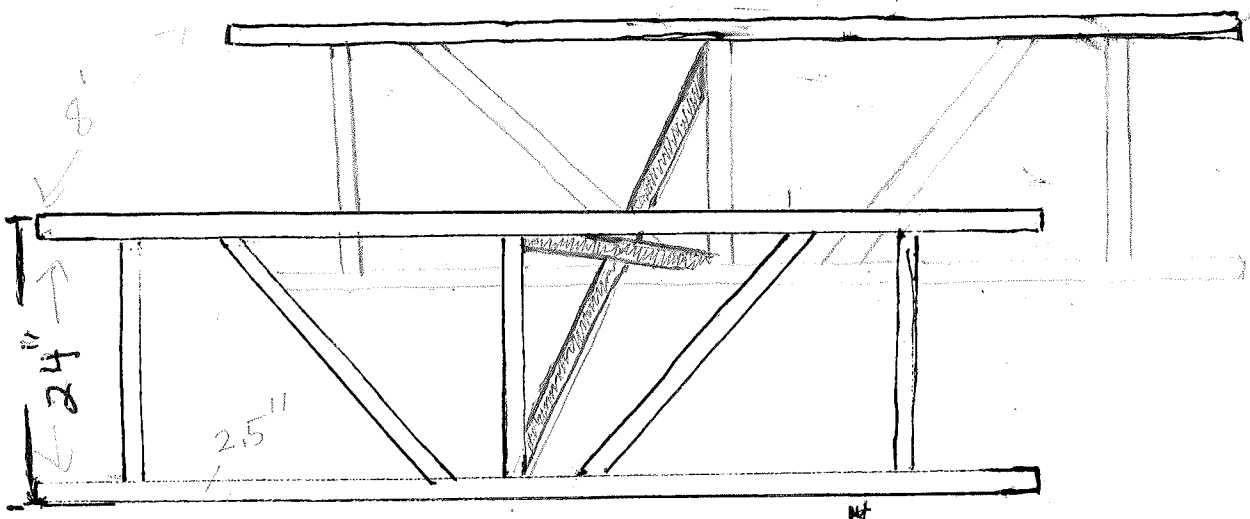
Geoff,
I put together some pictures, drawings and measurements. If there is other measurements you need, let me know and I can get them to you. I will be on vacation starting Thursday and won't be back until February 22, so if you need anything else let me know right away so that I can get them to you before I leave. Thank you,

Chuck Kerns
Building Systems Coordinator
CLACKAMAS COUNTY DEPARTMENT OF FINANCE | Facilities Management
1710 Red Soils Ct. Suite 200, Oregon City, OR 97045,
office 503.557-6420, mobile 503.780-4864
www.clackamas.us

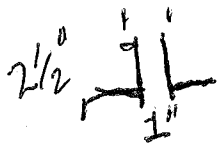
From: Kerns, Chuck <ChuckKer@clackamas.us>
Sent: Tuesday, February 8, 2022 8:26 AM
To: Kerns, Chuck <ChuckKer@clackamas.us>
Subject: PSTC



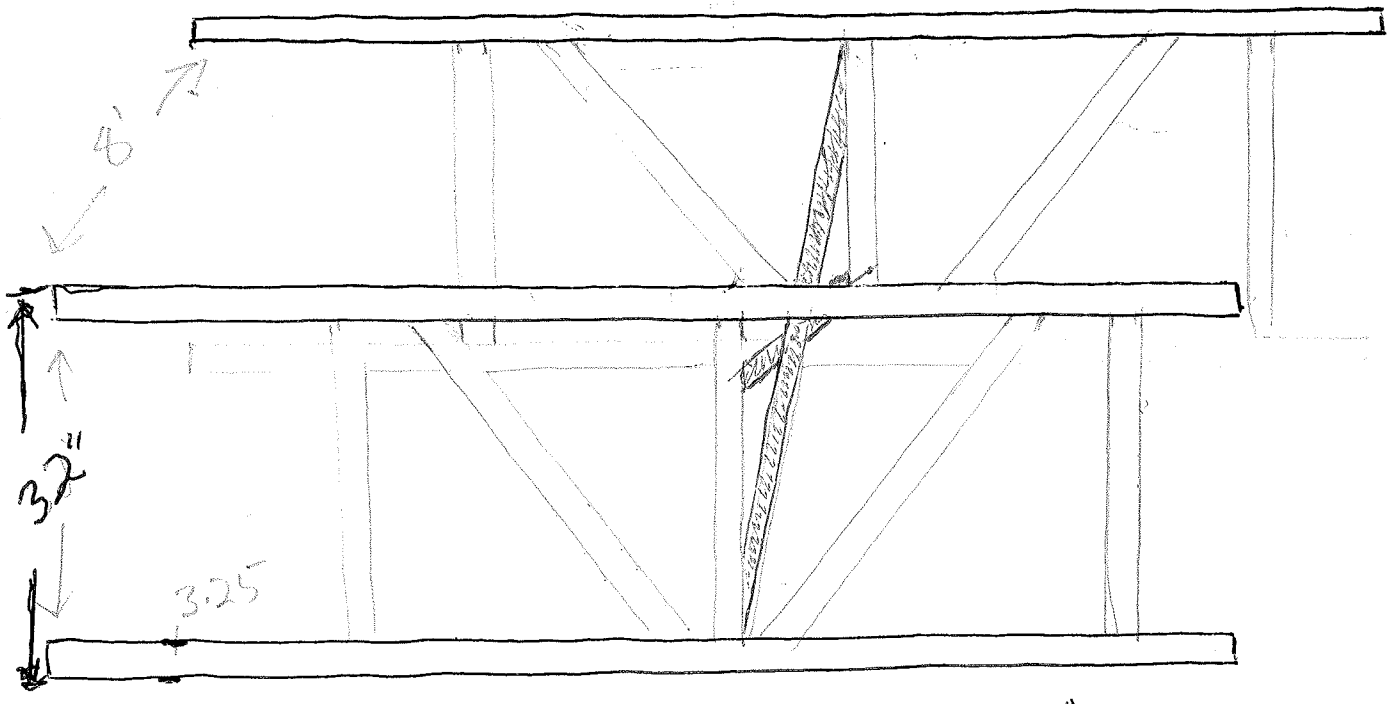
Sent from my iPhone



- police -



L = 1/4"



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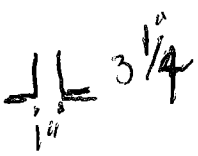

Client#: 180464 APEXMECH1

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 7/05/2022

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer any rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Leigh Penley
Propel Insurance Longview Commercial Insurance P.O. Box 9 Longview, WA 98632	PHONE (A/C, No, Ext): 800 499-0933 FAX (A/C, No): 866 577-1326 E-MAIL ADDRESS: leigh.penley@propelinsurance.com
	INSURER(S) AFFORDING COVERAGE — NAIC #
	INSURER A : Union Insurance Company — 25844
	INSURER B : Lloyd's Syndicate 3624
INSURED Apex Mechanical LLC Po Box 1652 Battle Ground, WA 98604	INSURER C : Burlington Insurance Company — 23620
	INSURER D :
	INSURER E :
	INSURER F :

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY			CPA6040753	07/20/2021	07/20/2022	EACH OCCURRENCE	$1,000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$300,000
	X PD Ded: $1,000						MED EXP (Any one person)	$10,000
							PERSONAL & ADV INJURY	$1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$2,000,000
	X POLICY PRO-JECT LOC						PRODUCTS - COMP/OP AGG	$2,000,000
	OTHER:						WA Stop Gap	$1,000,000
A	AUTOMOBILE LIABILITY			CPA6040753	07/20/2021	07/20/2022	COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	X HIRED AUTOS ONLY X NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
A	X UMBRELLA LIAB X OCCUR			CPA6040753	07/20/2021	07/20/2022	EACH OCCURRENCE	$5,000,000
C	X EXCESS LIAB CLAIMS-MADE			966BE04724	11/29/2021	07/20/2022	AGGREGATE	$5,000,000
	DED X RETENTION $0						Excess Lia.	$1,000,000
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED?	N / A					PER STATUTE OTH-ER	
	(Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. EACH ACCIDENT	$
							E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$
A	Lease/Rent Equip			CPA6040753	07/20/2021	07/20/2022	$100,000 / $1,000 Ded.	
A	Install Floater			CPA6040753	07/20/2021	07/20/2022	$1,500,000 / $1,000 Ded	
B	Pollution/Profess			ANE434166821	12/09/2021	12/09/2022	$2,000,000 / $2,000,000	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Project: BID#2022-56 | Public Safety Training Center MAU and Exhaust Replacement

Additional insured is on a primary and non-contributory basis and waiver of subrogation status applies per attached forms, if required by written contract for both General Liability and Automobile Liability.

CERTIFICATE HOLDER

Clackamas County
12700 SE 82nd Ave
Clackamas, OR 97015

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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Policy Number: **CPA 6040753 - 21**

SCHEDULE OF FORMS AND ENDORSEMENTS

The following Declarations, Coverage Forms, Conditions, and Endorsements are applicable to:

Commercial General Liability

Number	Edition	Description
B CG DS 01	10-2001	Commercial General Liability Declarations
CL CG 99 32	01-2015	Commercial General Liability Supplemental Declarations Schedule
CL CG FS 01	09-2008	Schedule of Forms and Endorsements
CG 00 01	04-2013	Commercial General Liability Coverage Form
CG 01 97	12-2007	Washington Changes - Employment - Related Practices Exclusion
CG 03 00	01-1996	Deductible Liability Insurance
CG 04 35	12-2007	Employee Benefits Liability Form
CG 21 06	05-2014	Exclusion - Access or Disclosure of Confidential Or Personal Information and Data-Related Liability - With Limited Bodily Injury Exception
CG 21 09	06-2015	Exclusion - Unmanned Aircraft
CG 21 54	12-2019	Exclusion - Designated Operations Covered By A Controlled (Wrap-Up) Insurance Program
CG 21 71	01-2015	Exclusion of Other Acts of Terrorism Committed Outside The United States; Cap on Losses From Certified Acts of Terrorism
CG 21 76	01-2015	Exclusion Of Punitive Damages Related To A Certified Act Of Terrorism
CG 21 86	12-2004	Exclusion - Exterior Insulation And Finish Systems
CG 21 96	03-2005	Silica Or Silica - Related Dust Exclusion
CG 22 79	04-2013	Exclusion - Contractors - Professional Liability
CG 24 27	04-2013	Limited Contractual Liability - Railroads
CG 26 77	12-2004	Washington - Fungi or Bacteria Exclusion
CL CG 00 20	10-2018	Contractor General Liability Platinum Endorsement
CL CG 01 14	09-2016	Primary and Noncontributory - Other Insurance Condition (Additional Insured)
CL CG 01 74	09-2016	Amendment of Insured Contract Definition
CL CG 02 02	01-2012	Notice Of Cancellation To Designated Person(s) Or Organization(s) Other Than The Named Insured
CL CG 04 92	10-2018	General Liability Ultra Plus Endorsement
CL CG 05 29	10-2018	General Liability Ultra Platinum Enhancement Coverages
CL CG 20 69	09-2017	Additional Insured - Contractors - Ongoing and Completed Operations - Scheduled Person(s) Or Organization(s) - Acts or Omissions
CL CG 20 70	09-2017	Additional Insured - Contractors - Ongoing and Completed Operations - Scheduled Person(s) or Organization(s)
CL CG 20 71	09-2016	Additional Insured - Owners, Lessees, Contractors or Others - Completed Operations - Automatic Status, Including Primary Noncontributory
CL CG 21 08 WA	05-2018	Asbestos Exclusion - Washington
CL CG 21 45	11-2010	Exclusion - Lead Exclusion
CL CG 21 82	03-2015	Exclusion - New Condominium Construction, Design, Development Or Conversion
CL CG 22 45 WA	09-2020	Stop Gap - Employers Liability Coverage Endorsement With Communicable Disease Exclusion - Washington
CW 31 06	12-2004	Additional Exclusions

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

CONTRACTOR GENERAL LIABILITY PLATINUM ENDORSEMENT

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

A. PROPERTY DAMAGE TO BORROWED EQUIPMENT

1. Paragraph **2.j.** of **SECTION I - COVERAGES, COVERAGE A BODILY INJURY AND PROPERTY DAMAGE LIABILITY** is amended as follows:

Paragraphs **(3)** and **(4)** of this exclusion do not apply to tools or equipment loaned to you, provided they are not being used to perform operations at the time of loss.

2. **SECTION III - LIMITS OF INSURANCE** is deleted and replaced by the following:

The most we will pay in any one "occurrence" for "property damage" to borrowed equipment is $15,000. This limit of insurance is the most we will pay regardless of the number of:

a. Insureds;

b. Claims made or "suits" brought; or

c. Persons or organizations making claims or bringing "suits".

3. **Deductible**

a. Our obligation to pay damages on behalf of the insured applies only to the amount of damages in excess of $250 as applicable to "property damage" as the result of any one "occurrence", regardless of the number of persons or organizations who sustain damages because of that "occurrence".

b. The terms of this insurance, including those with respect to our right and duty to defend the insured against any "suits" seeking those damages; and your duties in the event of an "occurrence", claim, or "suit" apply irrespective of the application of the deductible amount.

c. We may pay any part or all of the deductible amount to effect settlement of any claim or suit and, upon notification of the action taken; you shall promptly reimburse us for such part of the deductible amount as we have paid.

B. CONSTRUCTION PROJECT GENERAL AGGREGATE LIMIT

1. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under **COVERAGE A (SECTION I)**, and for all medical expenses caused by accidents under **COVERAGE C (SECTION I)**, which can be attributed only to ongoing operations at a single construction project away from premises owned by or rented to the insured:

a. A Single Construction Project General Aggregate Limit applies to each construction project away from premises owned by or rented to the insured, and that limit is equal to the amount of the General Aggregate Limit shown in the Declarations.

b. The Single Construction Project General Aggregate Limit is the most we will pay for the sum of all damages under **COVERAGE A,** except damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard", and for medical expenses under **COVERAGE C** regardless of the number of:

(1) Insureds;

(2) Claims made or "suits" brought; or

(3) Persons or organizations making claims or bringing "suits".

c. Any payments made under **COVERAGE A** for damages or under **COVERAGE C** for medical expenses shall reduce the Single Construction Project General Aggregate Limit for that construction project away from premises owned by or rented to the insured. Such payments shall not reduce the General Aggregate Limit shown in the Declarations nor shall they reduce any other Single Construction Project General Aggregate Limit for any other separate construction project away from premises owned by or rented to the insured.

d. The limits shown in the Declarations for Each Occurrence, Fire Damage and Medical Expense continue to apply. However, instead of being subject to the General Aggregate Limit shown in the Declarations, such limits will be subject to the applicable Single Construction Project General Aggregate Limit.

2. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under **COVERAGE A (SECTION I)**, and for all medical expenses caused by accidents under **COVERAGE C (SECTION I)**, which cannot be attributed only to ongoing operations at a single designated construction project away from premises owned by or rented to the insured:

a. Any payments made under **COVERAGE A** for damages or under **COVERAGE C** for medical expenses shall reduce the amount available under the General Aggregate Limit or the Products-Completed Operations Aggregate Limit, whichever is applicable; and

b. Such payments shall not reduce any Single Construction Project General Aggregate Limit.

3. When coverage for liability arising out of the "products-completed operations hazard" is provided, any payments for damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard" will reduce the Products-Completed Operations Aggregate Limit, and not reduce the General Aggregate Limit or the Single Construction Project General Aggregate Limit.

4. If the applicable construction project away from premises owned by or rented to the insured has been abandoned, delayed, or abandoned and then restarted, or if the authorized contracting parties deviate from plans, blueprints, designs, specifications or timetables, the project will still be deemed to be the same construction project.

5. The provisions of **Limits Of Insurance (SECTION III)** not otherwise modified by this endorsement shall continue to apply as stipulated.

C. LIMITED JOB SITE POLLUTION

1. Exclusion **f.** under **Section I - Coverage A** is replaced by the following:

2. Exclusions

This insurance does not apply to:

f. Pollution

(1) "Bodily injury" or "property damage" arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants":

(a) At or from any premises, site or location on which any insured or any contractors or subcontractors working directly or indirectly on any insured's behalf are performing operations if the operations are to test for, monitor, clean up, remove, contain, treat, detoxify or neutralize, or in any way respond to, or assess the effects of, "pollutants"; or

(b) At or from a storage tank or other container, ducts or piping which is below or partially below the surface of the ground or water or which, at any time, has been buried under the surface of the ground or water and then subsequently exposed by erosion, excavation or any other means if the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants" arises at or from any premises, site or location which any insured or any contractors or subcontractors working directly or indirectly on any insured's behalf are performing operations if the "pollutants" are brought on or to the premises, site or location in connection with such operations by such insured, contractor or subcontractor.

Subparagraph **(b)** does not apply to "bodily injury" or "property damage" arising out of heat, smoke or fumes from a "hostile fire".

(2) Any loss, cost or expense arising out of any:

(a) Request, demand, order or statutory or regulatory requirement issued or made pursuant to any environmental protection or environmental liability statutes or regulations that any insured test for, monitor, clean up, remove, contain, treat, detoxify or neutralize, or in any way respond to, or assess the effects of, "pollutants"; or

(b) Claim or suit by or on behalf of a governmental authority for damages because of testing for, monitoring, cleaning up, removing, containing, treating, detoxifying, or neutralizing or in any way responding to or assessing the effects of, "pollutants".

However, this paragraph does not apply to liability for those sums the insured becomes legally obligated to pay as damages because of "property damage" that the insured would have in the absence of such request, demand, order or statutory or regulatory requirement, or such claim or "suit" by or on behalf of a governmental authority.

2. With respect to "bodily injury" or "property damage" arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants":

a. The "Each Occurrence Limit" shown in the Declarations does not apply.

b. Paragraph **7.** of **Limits Of Insurance (Section III)** does not apply.

c. Paragraph **1.** of **Section III - Limits Of Insurance** is replaced by the following:

The Limits Of Insurance shown in this endorsement, or in the Declarations and the rules below fix the most we will pay regardless of the number of:

(1) Insureds;

(2) Claims made or "suits" brought; or

(3) Persons or organizations making claims or bringing "suits".

d. The following are added to **Section III - Limits Of Insurance:**

8. Subject to **2.** or **3.** above, whichever applies, the most we will pay for the sum of:

a. Damages under Coverage **A;** and

b. Medical expenses under Coverage **C**

because of "bodily injury" or "property damage" arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants" is $100,000 aggregate.

9. Subject to **8.** above, the Medical Expense Limit is the most we will pay under Coverage **C** for all medical expenses because of "bodily injury" sustained by any one person arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants".

D. VOLUNTARY PROPERTY DAMAGE

1. The following is added to **Section 1 - COVERAGES:**

We will pay, at your request for "property damage" to that part of any property:

a. Which you or any subcontractors working directly or indirectly on your behalf are performing operations; or

b. That must be restored, repaired or replaced because "your work" was incorrectly performed on it.

This insurance applies only to "property damage" to property of others while in your care, custody, or control, and arising out of operations away from your insured premises and incidental to your business.

Exclusions **j.(3),(4),(5)** and **(6)** do not apply to this coverage.

This insurance does not apply to "property damage" included within the "explosion hazard", the "collapse hazard" or the "underground property damage hazard".

2. For the purposes of the coverage provided by **D. VOLUNTARY PROPERTY DAMAGE**, **SECTION III - LIMITS OF INSURANCE** is replaced by the following:

A. Limits of Insurance

1. Unless a higher limit is shown in the Declarations, the most we will pay in any one "occurrence" for "property damage" under this endorsement is **$15,000**.

2. Unless a higher limit is shown in the Declarations**,** the most we will pay for all covered "occurrences" during any one policy period is **$15,000** Aggregate Limit of Insurance.

The Limits of Insurance of this endorsement apply separately to each consecutive annual period and to any remaining period of less than 12 months, starting with the beginning of the policy period shown in the Declarations, unless the policy period is extended after issuance for an additional period of less than 12 months. In that case, the additional period will be deemed part of the last preceding period for

purposes of determining the Limits of Insurance.

3. **Deductible**

   a. Our obligation to pay damages on behalf of the insured applies only to the amount of damages in excess of $250 as the result of any one "occurrence", regardless of the number of persons or organizations who sustain damages because of that "occurrence".

   b. The terms of this insurance, including those with respect to our right and duty to defend the insured against any "suits" seeking those damages; and your duties in the event of an "occurrence", claim, or "suit" apply irrespective of the application of the deductible amount.

   c. We may pay any part or all of the deductible amount to effect settlement of any claim or suit and, upon notification of the action taken; you shall promptly reimburse us for such part of the deductible amount as we have paid.

4. For the purposes of the coverage provided by **D. VOLUNTARY PROPERTY DAMAGE**, **SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS** is amended as follows:

   a. The following is added to paragraph **2. Duties In The Event Of Occurrence, Offense, Claim or Suit**:

   In the event of loss covered by this endorsement, the insured shall, if requested by us, replace the property or furnish the labor and materials necessary for repairs at actual cost to the insured, excluding prospective profit or overhead charges of any nature. Any property so paid for or replaced shall, at our option, become our property. Any payment made by us shall not constitute an admission of liability by an insured, or by us.

   b. Paragraph **4. Other Insurance** is amended as follows:

   (1) Paragraph **4.a. Primary Insurance** is deleted.

   (2) Subparagraphs **(1)** and **(2)** of paragraph **4.b. Excess Insurance** are deleted and replaced with the following:

   This insurance is excess over any of the other insurance, whether primary, excess, contingent or on any other basis.

   All other provisions that apply to paragraph **4. Other Insurance** contained in the Commercial General Liability Coverage Form are applicable.

5. For the purposes of the coverage provided by **D. VOLUNTARY PROPERTY DAMAGE**, the following definitions are added to **SECTION V - DEFINITIONS**:

   a. "Collapse hazard" includes "structural property damage" and any resulting "property damage" to any other property at any time.

   b. "Explosion hazard" includes "property damage" arising out of blasting or explosion. The "explosion hazard" does not include "property damage" arising out of the explosion of air or steam vessels, piping under pressure, prime movers, machinery or power transmitting equipment.

   c. "Structural property damage" means the collapse of or structural injury to any building or structure due to:

   (1) Grading of land, excavating, burrowing, filling, back-filling, tunneling, pile driving, cofferdam work or caisson work; or

   (2) Moving, shoring, underpinning, raising or demolition of any building or structure or removal or rebuilding of any structural support of that building or structure.

   d. "Underground property damage hazard" includes "underground property damage" and any resulting "property damage" to any other property at any time.

   e. "Underground property damage" means "property damage" to wires, conduits, pipes, mains, sewers, tanks, tunnels, any similar property, and any apparatus used with them beneath the surface of the ground or water, caused by and occurring during the use of mechanical equipment for the purpose of grading land, paving, excavating, drilling, burrowing, filling, back-filling or pile driving.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

PRIMARY AND NONCONTRIBUTORY – OTHER INSURANCE CONDITION (ADDITIONAL INSURED)

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

Paragraph **(v)** is added to Paragraph **(1)(a)** of Paragraph **b. Excess Insurance** under Paragraph **4. Other Insurance** of **Section IV – Commercial General Liability Conditions**, as follows:

(1) This insurance is excess over:

(a) Any of the other insurance, whether primary, excess, contingent or on any other basis:

(v) That is available to any person or organization who has been added as an additional insured to this policy by endorsement.

However, with respect to an additional insured added by endorsement for liability caused, in whole or in part:

1. By your acts or omissions, or the acts or omissions of those acting on your behalf:

(a) In the performance of your ongoing operations; or

(b) In connection with your premises;

2. By your maintenance, operation or use of equipment leased to you by such person or organization; or

3. By "your work" performed for that additional insured and included in the "products-completed operations hazard";

this insurance shall be primary to and will not seek contribution from the additional insured's own insurance if you and such additional insured have agreed prior to loss in a written contract or written agreement, in effect during this policy period, that this insurance be primary and noncontributory as respects liability described in Subparagraph **(1)(a)(v)1., (1)(a)(v)2.** or **(1)(a)(v)3.** above. However, this insurance, in all cases, is excess over any other liability insurance available to the additional insured to which such person or organization has been added as an additional insured.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

GENERAL LIABILITY ULTRA PLUS ENDORSEMENT

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SUMMARY OF COVERAGE EXTENSIONS

Provision	Name Of Coverage Extension	Included or Limit of Insurance
A.	Miscellaneous Additional Insureds	Included
B.	Expected Or Intended Injury Or Damage	Included
C.	Knowledge Of Occurrence	Included
D.	Legal Liability – Damage To Premises Rented To You (Fire, Lightning, Explosion, Smoke, Or Leakage From Automatic Fire Protective Systems)	$300,000
E.	Medical Payments	See Declarations
F.	Mobile Equipment Redefined	Included
G.	Newly Formed Or Acquired Organization, Partnership Or Limited Liability Company And Extended Period Of Coverage	Included
H.	Who Is An Insured – Amendment	Included
I.	Non-Owned Watercraft (Increased to maximum length of less than 51 feet)	Included
J.	Supplementary Payments – Increased Limits **1.** Bail Bonds **2.** Loss Of Earnings	 $ 3,000 $ 1,000
K.	Unintentional Omission Or Unintentional Error In Disclosure	Included
L.	Waiver Of Transfer Of Rights Of Recovery Against Others	Included
M.	Liberalization Clause	Included
N.	Incidental Medical Malpractice	Included

The above is a summary only. Please consult the specific provisions that follow for complete information on the extensions provided.

The provisions of the Commercial General Liability Coverage Part apply except as otherwise provided in this endorsement. This endorsement applies only if such Coverage Part is included in this policy.

A. MISCELLANEOUS ADDITIONAL INSUREDS

1. Section II – Who Is An Insured is amended to include as an insured any person or organization (referred to as an additional insured below) described in Paragraphs **A.1.c.(1)** through **A.1.c.(9)** below when you and such person or organization have agreed in writing in a contract or agreement that such person or organization be added as an additional insured on your policy, provided that:

a. The written contract or written agreement is:

(1) Currently in effect or becoming effective during the term of this policy; and

(2) Fully executed by you and the additional insured prior to the "bodily

injury", "property damage" or "personal and advertising injury".

b. The insurance afforded by this provision does not apply to any person or organization included as an additional insured by a separate endorsement issued by us and made a part of this policy or coverage part.

c. Only the following persons or organizations are additional insureds under this provision, with coverage for such additional insureds limited as provided herein:

(1) Persons or Organizations For Whom Operations Are Performed

(a) Any person or organization for whom you are performing operations when you and such person or organization have agreed in writing in a contract or agreement that such person or organization be added as an additional insured to your policy; and

(b) Any other person or organization you are required to add as an additional insured under the contract or agreement described in paragraph **(a)** above.

(c) Such person(s) or organization(s) is an additional insured only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

(i) Your acts or omissions; or

(ii) The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured.

(d) With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to:

(i) "Bodily injury", "property damage" or "personal and advertising injury" arising out of the rendering of, or the failure to render, any professional architectural, engineering or surveying services, including:

(1.1) The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or

(1.2) Supervisory, inspection, architectural or engineering activities.

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage", or the offense which caused the "personal and advertising injury", involved the rendering of, or the failure to render, any professional architectural, engineering or surveying services.

(ii) "Bodily injury" or "property damage" occurring after:

(1.1) All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or

(1.2) That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

(2) Managers Or Lessors Of Premises

A manager or lessor of premises but only with respect to liability arising out of the ownership, maintenance or use of that part of the premises leased to

you and subject to the following additional exclusions:

This insurance does not apply to:

(a) Any "occurrence" which takes place after you cease to be a tenant in that premises.

(b) Structural alterations, new construction or demolition operations performed by or on behalf of such additional insured.

(3) Mortgagee, Assignee Or Receiver

A mortgagee, assignee, or receiver but only with respect to their liability as mortgagee, assignee, or receiver and arising out of the ownership, maintenance, or use of a covered premises by you.

This insurance does not apply to structural alterations, new construction or demolition operations performed by or on behalf of such additional insured.

(4) Owners Or Other Interests From Whom Land Has Been Leased

An owner or other interest from whom land has been leased to you but only with respect to liability arising out of the ownership, maintenance or use of that part of the land leased to you and subject to the following additional exclusions:

This insurance does not apply to:

(a) Any "occurrence" which takes place after you cease to lease that land.

(b) Structural alterations, new construction or demolition operations performed by or on behalf of such additional insured.

(5) Lessor Of Leased Equipment

Any person(s) or organization(s) from whom you lease equipment but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by your maintenance, operation or use of equipment leased to you by such person(s) or organization(s).

A person's or organization's status as an additional insured under this endorsement ends when their written contract or written agreement with you for such leased equipment ends.

This insurance does not apply to any "occurrence" which takes place after the equipment lease expires.

(6) State, Municipality, Governmental Agency Or Subdivision Or Other Political Subdivision – Permits Or Authorizations Relating To Premises

Any state, municipality, governmental agency or subdivision or other political subdivision subject to the following additional provisions:

(a) This insurance applies only with respect to:

(i) The following hazards for which the state, municipality, governmental agency or subdivision or other political subdivision has issued a permit or authorization in connection with premises you own, rent or control and to which this insurance applies:

(1.1) The existence, maintenance, repair, construction, erection or removal of advertising signs, awnings, canopies, cellar entrances, coal holes, driveways, manholes, marquees, hoist away openings, sidewalk vaults, street banners or decorations and similar exposures; or

(1.2) The construction, erection or removal of elevators; or

(1.3) The ownership, maintenance or use of any elevators covered by this insurance.

(ii) Operations performed by you or on your behalf for which the state, municipality, governmental agency or subdivision or other political subdivision has issued a permit or authorization.

(b) This insurance does not apply to "bodily injury", "property damage" or "personal and advertising injury" arising out of operations performed for the state, municipality, governmental agency or subdivision or other political subdivision.

(7) Controlling Interest

Any person(s) or organization(s) with a controlling interest in the Named Insured but only with respect to their liability arising out of:

(a) Their financial control of you; or

(b) Premises they own, maintain or control while you lease or occupy these premises.

This insurance does not apply to structural alterations, new construction or demolition operations performed by or for such person(s) or organization(s).

(8) Co-Owner Of Insured Premises

A co-owner of a premises co-owned by you and covered under this insurance but only with respect to the co-owner's liability as co-owner of such premises.

(9) Vendors

(a) Any person(s) or organization(s) (referred to as vendor), but only with respect to "bodily injury" or "property damage" arising out of "your products" which are distributed or sold in the regular course of the vendor's business.

The insurance afforded the vendor does not apply to:

(i) "Bodily injury" or "property damage" for which the vendor is obligated to pay damages by reason of the assumption of liability in a written contract or written agreement. This exclusion does not apply to liability for damages that the vendor would have in the absence of the written contract or written agreement;

(ii) Any express warranty unauthorized by you;

(iii) Any physical or chemical change in the product made intentionally by the vendor;

(iv) Repackaging, except when unpacked solely for the purpose of inspection, demonstration, testing, or the substitution of parts under instructions from the manufacturer, and then repackaged in the original container;

(v) Any failure to make such inspections, adjustments, tests or servicing as the vendor has agreed to make or normally undertakes to make in the usual course of business, in connection with the distribution or sale of the products;

(vi) Demonstration, installation, servicing or repair operations, except such operations performed at the vendor's premises in connection with the sale of the product;

(vii) Products which, after distribution or sale by you, have been labeled or relabeled or used as a container, part or ingredient of any other thing or substance by or for the vendor; or

(viii) "Bodily injury" or "property damage" arising out of the sole negligence of the vendor for its own acts or omissions or those of its employees or anyone else acting on its behalf. However, this exclusion does not apply to:

(1.1) The exceptions contained in Sub-paragraphs **(iv)** or **(vi)**; or

(1.2) Such inspections, adjustments, tests or servicing as the vendor has agreed to make or normally undertakes to make

in the usual course of business, in connection with the distribution or sale of the products.

(b) This insurance does not apply to any insured person or organization, from whom you have acquired products, or any ingredient, part or container, entering into, accompanying or containing such products.

2. With respect to coverage provided by this Provision **A. Miscellaneous Additional Insureds**, the following additional provisions apply:

a. Any insurance provided to an additional insured designated under Paragraphs **A.1.c.(1)** through **A.1.c.(8)** above does not apply:

(1) To "bodily injury" or "property damage" included within the "products-completed operations hazard"; or

(2) To "bodily injury", "property damage" or "personal and advertising injury" arising out of the sole negligence of such additional insured.

b. The insurance afforded to such additional insured only applies to the extent permitted by law.

c. The insurance afforded to such additional insured will not be broader than that which you are required to provide by the written contract or written agreement.

3. With respect to the insurance afforded to the additional insureds within this Provision **A. Miscellaneous Additional Insureds**, the following is added to **Section III – Limits Of Insurance**:

The most we will pay on behalf of the additional insured is the amount of insurance:

a. Required by the written contract or written agreement; or

b. Available under the applicable Limits Of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits Of Insurance shown in the Declarations.

B. EXPECTED OR INTENDED INJURY OR DAMAGE

Exclusion **2.a. Expected Or Intended Injury** of **Section I – Coverage A – Bodily Injury And Property Damage Liability** is deleted and replaced by the following:

a. Expected Or Intended Injury Or Damage

"Bodily injury" or "property damage" expected or intended from the standpoint of the insured. This exclusion does not apply to "bodily injury" or "property damage" resulting from the use of reasonable force to protect persons or property.

C. KNOWLEDGE OF OCCURRENCE

Paragraph **2.a. Duties In The Event Of Occurrence, Offense, Claim Or Suit** of **Section IV – Commercial General Liability Conditions** is deleted and replaced by the following:

a. You must see to it that we are notified as soon as practicable of an "occurrence" or an offense which may result in a claim only when the "occurrence" or offense is known to:

(1) You, if you are an individual;

(2) A partner, if you are a partnership;

(3) A manager, if you are a limited liability company; or

(4) An "executive officer" or the "employee" designated by you to give such notice, if you are an organization other than a partnership or a limited liability company.

To the extent possible, notice should include:

(i) How, when and where the "occurrence" or offense took place;

(ii) The names and addresses of any injured persons and witnesses; and

(iii) The nature and location of any injury or damage arising out of the "occurrence" or offense.

D. LEGAL LIABILITY – DAMAGE TO PREMISES RENTED TO YOU (Fire, Lightning, Explosion, Smoke, Or Leakage From Automatic Fire Protective Systems)

If damage to premises rented to you is not otherwise excluded from this policy or coverage part, then the following provisions apply:

1. Under **Section I – Coverage A – Bodily Injury And Property Damage Liability**, the last paragraph (after the exclusions) is deleted and replaced by the following:

Exclusions **c.** through **n.** do not apply to damage by fire, lightning, explosion, "smoke", or leakage from automatic fire protective systems to premises while rented to you or temporarily occupied by you with the permission of the owner. A separate limit of insurance applies to this coverage as described in **Section III – Limits Of Insurance**.

2. The paragraph immediately after Subparagraph **j.(6)** of Paragraph **2. Exclusions** of **Section I – Coverage A – Bodily Injury And Property Damage Liability** is deleted and replaced by the following:

Paragraphs **(1)**, **(3)** and **(4)** of this exclusion do not apply to "property damage" (other than damage by fire, lightning, explosion, "smoke", or leakage from automatic fire protective systems) to premises, including the contents of such premises, rented to you for a period of seven or fewer consecutive days. A separate limit of insurance applies to Damage To Premises Rented To You as described in **Section III – Limits Of Insurance.**

3. Paragraph **6.** of **Section III – Limits Of Insurance** is deleted and replaced by the following:

6. Subject to Paragraph **5.** above, the greater of:

a. $300,000; or

b. The Damage To Premises Rented To You Limit shown in the Declarations,

is the most we will pay under **Coverage A** for damages because of "property damage" to premises while rented to you, or in the case of damage by fire, lightning, explosion, "smoke", or leakage from automatic fire protective systems, while rented to you or temporarily occupied by you with permission of the owner.

This limit will apply to all damage proximately caused by the same event, whether such damage results from fire, lightning, explosion, "smoke", leakage from automatic fire protective systems, or other covered causes of loss or any combination thereof.

4. Subparagraph **b.(1)(a)(ii)** of Paragraph **4. Other Insurance** of **Section IV – Commercial General Liability Conditions** is deleted and replaced by the following:

(ii) That is fire, lightning, explosion, "smoke" or leakage from automatic fire protective systems insurance for premises rented to you or temporarily occupied by you with permission of the owner;

5. Subparagraph **a.** of Definition **9.** "Insured contract" of **Section V – Definitions** is deleted and replaced by the following:

a. A contract for a lease of premises. However, that portion of the contract for a lease of premises that indemnifies any person or organization for damage by fire, lightning, explosion, "smoke" or leakage from automatic fire protective systems to premises while rented to you or temporarily occupied by you with permission of the owner is not an "insured contract".

6. As used in this Provision **D. Legal Liability – Damage To Premises Rented To You**:

"Smoke" does not include smoke from agricultural smudging, industrial operations or "hostile fire".

E. MEDICAL PAYMENTS

The Medical Expense Limit is changed, subject to the terms of **Section III – Limits Of Insurance**, to the Medical Expense Limit shown in the Declarations.

F. MOBILE EQUIPMENT REDEFINED

Subparagraph **f.(1)** of Definition **12.** "Mobile equipment" of **Section V – Definitions** is deleted and replaced by the following:

(1) Equipment with a gross vehicle weight of 1,000 pounds or more and designed primarily for:

(a) Snow removal;

(b) Road maintenance, but not construction or resurfacing; or

(c) Street cleaning;

G. NEWLY FORMED OR ACQUIRED ORGANIZATION, PARTNERSHIP OR LIMITED LIABILITY COMPANY AND EXTENDED PERIOD OF COVERAGE

Paragraph **3.** of **Section II – Who Is An Insured** is deleted and replaced by the following:

3. Any organization you newly acquire or form, other than a joint venture, and over which you maintain ownership or:

a. Majority interest of more than 50% if you are a corporation;

b. Majority interest of more than 50% as a general partner of a newly acquired or formed partnership; and/or

c. Majority interest of more than 50% as an owner of a newly acquired or formed limited liability company;

will qualify as a Named Insured if there is no other similar insurance available to that organization. However, for these organizations:

(i) Coverage under this provision is afforded only until the next anniversary date of this policy's effective date after you acquire or form the organization, partnership or limited liability company, or the end of the policy period, whichever is earlier;

(ii) **Section I – Coverage A – Bodily Injury And Property Damage Liability** does not apply to "bodily injury" or "property damage" that occurred before you acquired or formed the organization, partnership or limited liability company;

(iii) **Section I – Coverage B – Personal And Advertising Injury Liability** does not apply to "personal and advertising injury" arising out of an offense committed before you acquired or formed the organization, partnership or limited liability company;

(iv) Coverage applies only when operations of the newly acquired organization, partnership or limited liability company are the same or similar to the operations of insureds already covered under this insurance;

(v) Coverage only applies for those limited liability companies who have established a date of formation as recorded within the filed state articles of organization, certificates of formation or certificates of organization; and

(vi) Coverage only applies for those partnerships who have established a date of formation as recorded within a written partnership agreement or partnership certificate.

H. WHO IS AN INSURED – AMENDMENT

The last paragraph of **Section II – Who Is An Insured** is deleted and replaced by the following:

No person or organization is an insured with respect to the conduct of any:

a. Current partnership or limited liability company, unless otherwise provided for under Paragraph **3.** of **Section II – Who Is An Insured**;

b. Current joint venture; or

c. Past partnership, joint venture or limited liability company;

that is not shown as a Named Insured in the Declarations.

I. NON-OWNED WATERCRAFT

Subparagraph **(2)** of **Exclusion 2.g. Aircraft, Auto Or Watercraft** of **Section I – Coverage A – Bodily Injury And Property Damage Liability** is deleted and replaced by the following:

(2) A watercraft you do not own that is:

(a) Less than 51 feet long; and

(b) Not being used to carry persons or property for a charge.

J. SUPPLEMENTARY PAYMENTS – INCREASED LIMITS

Section I – Supplementary Payments – Coverages A And B is changed as follows:

1. The limit shown in Paragraph **1.b.** for the cost of bail bonds is changed from $250 to $3,000; and

2. The limit shown in Paragraph **1.d.** for loss of earnings because of time off from work is changed from $250 a day to $1,000 a day.

K. UNINTENTIONAL OMISSION OR UNINTENTIONAL ERROR IN DISCLOSURE

The following provision is added to Paragraph **6. Representations** of **Section IV – Commercial General Liability Conditions**:

However, the unintentional omission of, or unintentional error in, any information given or provided by you shall not prejudice your rights under this insurance.

This provision does not affect our right to collect additional premium or to exercise our right of cancellation or non-renewal.

L. WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS

The following is added to Paragraph **8. Transfer Of Rights Of Recovery Against Others To Us** of **Section IV – Commercial General Liability Conditions**:

We waive any right of recovery we may have against any person or organization because of payments we make for injury or damage arising out of your ongoing operations or "your work" and included in the "products-completed operations hazard" when you have agreed in a written contract or written agreement that any right of recovery is waived for such person or organization. This waiver applies only to the

person(s) or organization(s) agreed to in the written contract or written agreement and is subject to those provisions.

This waiver does not apply unless the written contract or written agreement has been executed prior to the "bodily injury" or "property damage".

However, if any person or organization is separately scheduled on a separate waiver of transfer of rights of recovery which is attached to this policy, then this waiver does not apply.

M. LIBERALIZATION CLAUSE

The following is added to **Section IV – Commercial General Liability Conditions:**

If we adopt a mandatory attachment form change which broadens coverage under this edition of the Commercial General Liability CG0001 for no additional charge, and those changes are intended to apply to all insureds under this edition of CG0001, that change will automatically apply to your insurance as of the date we implement the change in your state. This liberalization clause does not apply to changes implemented through introduction of a subsequent edition of the Commercial General Liability form CG0001.

N. INCIDENTAL MEDICAL MALPRACTICE

1. Paragraph **2.a.(1)(d)** of **Section II – Who Is An Insured** does not apply to a physician, nurse practitioner, physician assistant, nurse, emergency medical technician or paramedic employed by you if you are not in the business or occupation of providing medical, paramedical, surgical, dental, x-ray or nursing services.

2. This provision is excess over any other valid and collectible insurance whether such insurance is primary, excess, contingent or on any other basis. Any payments by us will follow Paragraph **4.b.** of **Section IV – Commercial General Liability Conditions**.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

GENERAL LIABILITY ULTRA PLATINUM ENHANCEMENT COVERAGES

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE FORM
CONTRACTORS' COMMERCIAL GENERAL LIABILITY ENHANCEMENT ENDORSEMENT
GENERAL LIABILITY ULTRA PLUS ENDORSEMENT

A. General Liability Ultra Plus Endorsement CL CG 04 92, Provision A. Miscellaneous Additional Insureds, is revised as follows:

1. The following is added to **(1) Persons or Organizations For Whom Operations Are Performed**, **c.(1)**:

a. If the written contract specifically requires you to provide additional insured coverage via the 10/01 edition of **CG 20 10** (aka **CG 20 10 10 01**) or via the 11/85 edition of **CG 20 10** (aka **CG 20 10 11 85**), then in paragraph **1.c.(1)(c).**, the words *caused in whole or in part by,* are replaced by the words *arising out of*.

b. For purposes of this additional insured coverage, the terms "you" and "your" refer to the Named Insured shown in the Declarations.

B. CONTRACTUAL LIABILITY - RAILROADS

The following coverage is added:

1. With respect to operations performed for a Railroad within 50 feet of railroad property, the definition of "insured contract" in **Section V - Definitions** is replaced by the following:

9. "Insured Contract" means:

a. A contract for a lease of premises. However, that portion of the contract for a lease of premises that indemnifies any person or organization for damage by fire to premises while rented to you or temporarily occupied by you with permission of the owner is not an "insured contract";

b. A sidetrack agreement;

c. Any easement or license agreement;

d. An obligation, as required by ordinance, to indemnify a municipality, except in connection with work for a municipality;

e. An elevator maintenance agreement;

f. That part of any other contract or agreement pertaining to your business (including an indemnification of a municipality in connection with work performed for a municipality) under

which you assume the tort liability of another party to pay for "bodily injury" or property damage" to a third person or organization. Tort liability means a liability that would be imposed by law in the absence of any contract or agreement.

Paragraph **f.** does not include that part of any contract or agreement:

(1) That indemnifies an architect, engineer or surveyor for injury or damage arising out of:

(a) Preparing, approving or failing to prepare or approve maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or

(b) Giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage;

(2) Under which the insured, if an architect, engineer or surveyor, assumes liability for an injury or damage arising out of the insured's rendering or failure to render professional services, including

those listed in Paragraph **(1)** above and supervisory, inspection, architectural or engineering activities.

2. Other Insurance

For purposes of this endorsement, the following is added to the **Section IV - Commercial General Liability Conditions, 4 Other Insurance** condition and supersedes any provision to the contrary.

This insurance is excess of all other insurance that is Railroad Protective Liability or similar coverage for "your work" performed for a Railroad. But, if required by a written contract or written agreement to be primary and noncontributory, this insurance will be primary to and will not seek contribution from any insurance on which the Railroad is a Named Insured.

No other coverage or limit in the policy applies to loss or damage insured by this coverage.

C. AGGREGATE LIMITS OF INSURANCE

The following is added to **COMMERCIAL GENERAL LIABILITY COVERAGE FORM CG 00 01,** General Aggregate Limit under **SECTION III – LIMITS OF INSURANCE**:

The General Aggregate Limit under **SECTION III - LIMITS OF INSURANCE** applies separately to each of your

1. Projects away from premises owned by or rented to you.

2. "Locations" owned by or rented to you.

"Location" means premises involving the same or connecting lots, or premises whose connection is interrupted only by a street, roadway, waterway or right-of-way of a railroad.

When paragraph **B. Construction Project General Aggregate Limit** on form **CL CG 00 20** is a part of this policy, then this endorsement **CL CG 05 29** paragraph **C. Aggregate Limits Of Insurance** does not apply.

D. BODILY INJURY REDEFINED

The definition of "Bodily injury" in the **Definitions** section of the COMMERCIAL GENERAL LIABILITY COVERAGE FORM **CG 00 01** is replaced by the following:

"Bodily injury" means bodily injury, disability, sickness or disease sustained by a person, including death resulting from any of these at any time. "Bodily injury" includes mental anguish or other mental injury resulting from "bodily injury".

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED - CONTRACTORS - ONGOING AND COMPLETED OPERATIONS - SCHEDULED PERSON(S) OR ORGANIZATION(S)

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE*

Name Of Additional Insured Person(s) Of Organization(s)	Location(s) and Description(s) Of Covered Operations including Completed Operations
,	
*Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. **SECTION II - Who Is An Insured** is amended to include as an additional insured:

1. any person(s) or organization(s) shown in the Schedule for whom you are obligated by virtue of a written contract or agreement that such person(s) or organizations(s) be added as an additional insured to your policy, or

2. any other person(s) or organization(s) you are required to add as an additional insured under such contract or agreement.

Such person(s) or organization(s) shown in the Schedule is an additional insured only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" arising out of the Named Insured's ongoing work or those acting on behalf of the Named Insured at the location(s) designated and described in the Schedule of this endorsement performed for that additional insured and/or included in the "product-completed operations hazard".

This insurance applies only when you are required to add the scheduled additional insured by a written contract or agreement, provided the contract or agreement is:

(1) Currently in effect or becomes effective during the term of this policy; and

(2) Was executed prior to the "bodily injury", "property damage" or "personal and advertising injury"

However:

a. The insurance afforded to such additional insured only applies to the extent permitted by law; and

b. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

For purposes of this endorsement, throughout the policy, the terms "you" and "your" refer to the Named Insured shown in the Declarations.

B. **Exclusions**

With respect to the insurance afforded to these additional insureds, the following additional exclusions apply to "bodily injury" and "property damage" arising out of:

1. The rendering of or failure to render any professional services by you or on your behalf, but only with respect to either or both of the following operations:

a. Providing engineering, architectural or surveying services to others in your capacity as an engineer, architect or surveyor; and

b. Providing, or hiring independent professionals to provide, engineering,

architectural or surveying services in connection with construction work you perform.

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage", or the offense which caused the "personal and advertising injury", involved the rendering of, or the failure to render, any professional architectural, engineering or surveying services.

2. Subject to Paragraph **3.** below, professional services include:

a. Preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders, or drawings and specifications; and

b. Supervisory or inspection activities performed as part of any related architectural or engineering activities.

3. Professional services do not include services within construction means, methods, techniques, sequences and procedures employed by you or performed by or for the construction manager, its employees or its subcontractors in connection with your ongoing operations.

C. Limits of Insurance

With respect to the insurance afforded to these additional insureds, the following is added to **Section III - Limits Of Insurance**:

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or

2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

D. Other Insurance

For purposes of this endorsement, the following is added to the Other Insurance condition and supersedes any provision to the contrary:

This insurance is excess of all other insurance available to an additional insured whether on a primary, excess, contingent or any other basis. But, if required by a written contract or written agreement to be primary and noncontributory, this insurance will be primary to and will not seek contribution from any insurance on which the additional insured is a Named Insured.

No other coverage or limit in the policy applies to loss or damage insured by this coverage.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED - OWNERS, LESSEES, CONTRACTORS OR OTHERS - COMPLETED OPERATIONS - AUTOMATIC STATUS, INCLUDING PRIMARY NONCONTRIBUTORY

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

A. **SECTION II - WHO IS AN INSURED** is amended to include as an additional insured any person(s) or organization(s) when you are obligated by virtue of a written contract or agreement that such person or organization(s) be added as an additional insured to your policy.

Such person(s) or organization(s) is an additional insured only with respect to liability for "bodily injury" or "property damage" or "personal and advertising injury" caused, in whole or in part by:

(1) Acts or omissions of the Named Insured; or

(2) The acts or omissions of those acting on behalf of the Named Insured;

and included in the “products-completed operations hazard”

This insurance applies only when you are required to add the additional insured by virtue of a written contract or agreement, provided the contract or agreement is:

1. Currently in effect or becomes effective during the term of this policy; and

2. Was executed prior to the "bodily injury" or "property damage" or "personal and advertising injury".

However:

a. The insurance afforded to such additional insured only applies to the extent permitted by law; and

b. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

For purposes of this endorsement, throughout the policy, the terms "you" and "your" refer to the Named Insured shown in the Declarations.

B. **Exclusions**

With respect to the insurance afforded to these additional insureds, the following additional exclusions apply to "bodily injury" and "property damage" arising out of:

1. The rendering of or failure to render any professional services by you or on your behalf, but only with respect to either or both of the following operations:

a. Providing engineering, architectural or surveying services to others in your capacity as an engineer, architect or surveyor; and

b. Providing, or hiring independent professionals to provide, engineering, architectural or surveying services in connection with construction work you perform.

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage", or the offense which caused the "personal and advertising injury", involved the rendering of, or the failure to render, any professional architectural, engineering or surveying services.

2. Subject to Paragraph **3.** below, professional services include:

a. Preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders, or drawings and specifications; and

b. Supervisory or inspection activities performed as part of any related architectural or engineering activities.

3. Professional services do not include services within construction means, methods, techniques, sequences and procedures employed by you or performed by or for the construction manager, its employees or its subcontractors in connection with your ongoing operations.

C. Limits of Insurance

With respect to the insurance afforded to these additional insureds, the following is added to **Section III - Limits Of Insurance**:

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or

2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

D. Other Insurance

For purposes of this endorsement, the following is added to the **Section IV - Commercial General Liability Conditions, 4. Other Insurance** condition and supersedes any provision to the contrary:

This insurance is excess of all other insurance available to an additional insured whether on a primary, excess, contingent or any other basis. But, if required by a written contract or written agreement to be primary and noncontributory, this insurance will be primary to and will not seek contribution from any insurance on which the additional insured is a Named Insured.

No other coverage or limit in the policy applies to loss or damage insured by this coverage.

Policy Number: **CPA 6040753 - 21**

SCHEDULE OF FORMS AND ENDORSEMENTS

The following Declarations, Coverage Forms, Conditions, and Endorsements are applicable to:

Commercial Auto

Number	Edition	Description
B CA DS 03	07-2021	Business Auto Declarations
CL CA FS 01	09-2008	Schedule of Forms and Endorsements
CA 00 01	11-2020	Business Auto Coverage Form
CA 01 35	02-2021	Washington Changes
CA 20 70	10-2013	Coverage For Certain Operations In Connection With Railroads
CA 21 34	10-2013	Washington Underinsured Motorists Coverage
CA 22 57	10-2013	Washington Personal Injury Protection - Named Individuals
CA 23 45	11-2020	Public Or Livery Passenger Conveyance And On-Demand Delivery Services Exclusion
CA 23 92	10-2013	Washington Exclusion of Terrorism
CA 23 94	10-2013	Silica Or Silica-Related Dust Exclusion For Covered Autos Exposure
CA 99 03	10-2013	Auto Medical Payments Coverage
CA 99 89	05-2001	Washington Loss Payable Form Reg-335
CL CA 01 08	02-2015	Asbestos Exclusion
CL CA 01 49	07-2021	Commercial Automobile Expansion Endorsement Platinum
CW 32 28 WA	02-2015	Named Driver Exclusion - Washington

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

COMMERCIAL AUTOMOBILE EXPANSION ENDORSEMENT - PLATINUM

This endorsement modifies insurance provided under the following:

BUSINESS AUTO COVERAGE FORM

With respect to the coverages provided by this endorsement, the provisions of the Business Auto Coverage Form apply unless modified by this endorsement.

A. NEWLY ACQUIRED OR FORMED ORGANIZATIONS

The following is added to Paragraph **A.1.** Who Is An Insured of Section **II** - Covered Autos Liability Coverage:

Any organization you newly acquire or form, other than a partnership, joint venture or limited liability company or any organization excluded either by this Coverage Part or by endorsement, and over which you maintain ownership or majority interest of more than 50 percent will qualify as a Named Insured. However:

1. This insurance does not apply to any newly acquired or formed organization that is an "insured" under any other automobile policy or would be an "insured" under such policy but for its termination or the exhaustion of its Limit of Insurance.

2. Coverage does not apply to "bodily injury" or "property damage" that occurred before you acquired or formed the organization.

3. Coverage under this provision is afforded only until the 180th day after you acquire or form the organization or the end of the policy period, whichever is earlier.

B. ADDITIONAL INSURED BY CONTRACT OR AGREEMENT

The following is added to Paragraph **A.1.**, Who Is An Insured of Section **II** - Covered Autos Liability Coverage:

When you have agreed in a written contract or agreement to include a person or organization as an additional "insured", such person or organization is included as an "insured" subject to the following:

1. Such person or organization is an additional "insured" only to the extent such person or organization is liable for "bodily injury" or "property damage": because of the conduct of an "insured" under Paragraphs **a.** or **b.** under Paragraph **A.1.** Who Is An Insured of Section **II** - Covered Autos Liability Coverage, caused by an "accident" and resulting from the ownership, maintenance or use of a covered "auto";

2. The written contract or agreement described above must have been executed prior to the "accident" that caused the "bodily injury" or "property damage" and be in effect at the time of such "accident";

3. The insurance afforded to any such additional "insured" does not apply to any "accident" beyond the period of time required by the written contract or agreement described above;

4. The most we will pay on behalf of such additional "insured(s)" is the lesser of:

a. The Limits of Insurance specified in the written contract or agreement described above; or

b. The Limits of Insurance shown in the Declarations.

This provision shall not increase the Limit of Insurance shown in the Declarations in this policy or coverage part; and

5. The following changes are made to Paragraph **5.** Other Insurance of **B.** General Conditions under Section **IV** - Business Auto Conditions:

a. The following is added to Paragraph **5.a.**:

If required by the written contract or agreement described above, the

insurance afforded to the additional insured under this provision will be primary to, and will not seek contribution from, the additional insured's own insurance.

b. Paragraph **5.c.** is deleted in its entirety.

6. Paragraph **A.1.c.** under Section **II** - Covered Autos Liability Coverage is deleted in its entirety.

7. The definition of "insured contract" under Section **V** - Definitions is amended to add the following:

An "insured contract" does not include that part of any contract or agreement:

That pertains to the ownership, maintenance or use of an "auto" and which indemnifies a person or organization for other than the vicarious liability of such person or organization for "bodily injury" or "property damage" caused by your operation or use of a covered "auto".

However, a person or organization is an additional "insured" under this provision only to the extent such person or organization is not named as an "insured" by separate endorsement to this policy.

C. EMPLOYEES AS INSUREDS

The following is added to Paragraph **A.1.** Who Is An Insured Section **II** - Covered Autos Liability Coverage:

Any "employee" of yours is an "insured" while using a covered "auto" you don't own, hire or borrow in your business or your personal affairs.

D. INCREASED COVERAGE - BAIL BONDS

The Supplementary Payments Coverage Extension of Section **II** - Covered Autos Liability Coverage is amended as follows:

The Limit of Insurance in paragraph **A.2.a.(2)** is increased to $5,000.

E. INCREASED COVERAGE - LOSS OF EARNINGS

The Supplementary Payments Coverage Extension of Section **II** - Covered Autos Liability Coverage is amended as follows:

The Limit of Insurance in paragraph **A.2.a.(4)** is increased to $1,000.

F. FELLOW EMPLOYEE COVERAGE

The Fellow Employee Exclusion contained in Section **II** - Covered Autos Liability Coverage does not apply. This coverage is excess over any other collectable insurance.

G. COVERAGE EXTENSION - TRANSPORTATION EXPENSES

Paragraph **A.4.a.** Transportation Expenses of Section **III** - Physical Damage Coverage is amended as follows:

1. The Limits of Insurance are increased to $75 per day to a maximum of $2,500.

2. We will also pay reasonable and necessary expenses to facilitate the return of the stolen "auto" to you.

3. It is agreed and understood and it is our stated intent that expenses incurred by you under the Transportation Expenses Coverage Extension will not also be covered or paid under the Rental Reimbursement Coverage provided by this endorsement or any rental reimbursement coverage added by separate endorsement to this policy.

H. EXTENDED COVERAGE - AIRBAGS

The following is added to Exclusion **B.3.a.** of Section **III** - Physical Damage Coverage:

However, this exclusion does not apply to the unintended discharge of an airbag.

This coverage is excess over any other collectible insurance or warranty providing such airbag coverage.

I. AUTO LOAN/LEASE GAP COVERAGE

The following is added to Section **III** - Physical Damage Coverage, Paragraph **C.** Limits of Insurance.

4. In the event of a total "loss" to a covered "auto", we will pay the lesser of:

a. Any unpaid amount due on the lease or loan for a covered “auto”, less:

(1) The amount under the Physical Damage Coverage section of the policy; and

(2) Any:

(a) Overdue lease/loan payments at the time of the "loss";

(b) Financial penalties imposed under a lease for excessive use, abnormal wear and tear or high mileage;

(c) Security deposits not returned by the lessor;

(d) Costs for extended warranties, Credit Life Insurance, Health, Accident or Disability Insurance purchased with the loan or lease; and

(e) Carry-over balances from previous loans or leases; or

b. $5,000.

However, this provision does not apply to the extent loan/lease gap coverage has been provided by separate endorsement to this policy.

J. GLASS REPAIR - NO DEDUCTIBLE

The following is added to Paragraph **D.** Deductible of Section **III** - Physical Damage Coverage: Any Comprehensive Coverage deductible shown in the Declarations does not apply to "loss" to glass breakage when you elect to patch or repair rather than replace the glass.

This provision does not apply to any covered "auto" provided Physical Damage Coverage under **CA 04 21** - Full Safety Glass Coverage.

K. INCREASED COVERAGE - ELECTRONIC EQUIPMENT

The $1,000 limit indicated in Paragraph **C.1.b.** under Section **III** - Physical Damage Coverage is increased to $2,500.

L. EXTENDED COVERAGE - PERSONAL PROPERTY

The following is added to Paragraph **A.4.** Coverage Extensions of Section **III** - Physical Damage Coverage:

Physical Damage Coverage on a covered "auto" may be extended to "loss" to your personal property or, if you are an individual, the personal property of a family member, that is in the covered "auto" at the time of "loss" and caused by an "accident" and resulting from the ownership, maintenance or use of a covered "auto".

The insurance provided by this coverage extension is excess over any other collectible insurance. The most we will pay for any one "loss" under this coverage extension is $500. However, our payment for "loss" to personal property will only be for the account of the owner of the property.

Under this provision, personal property does not include and we will not pay for "loss" of currency, coins, securities or contraband.

No deductible applies to this coverage extension.

M. TOWING

Paragraph **A.2.** Towing of Section **III** - Physical Damage Coverage, is replaced by the following: If a private passenger type "auto" or light truck "auto" (0-10,000 Lbs. GVW) is provided both Comprehensive and Collision Coverage, we will pay up to $150 for towing and labor costs incurred each time such "auto" is disabled. If a medium, heavy or extra-heavy truck or extra-heavy Truck-tractor "auto" (greater than 10,000 Lbs. GVW) is provided both Comprehensive and Collision Coverage, we will pay up to $250 for towing and labor costs incurred each time such "auto" is disabled. However, the labor must be performed at the place of disablement.

N. FIRE EXTINGUISHER RECHARGE

The following is added to Paragraph **A.4.** Coverage Extensions of Section **IV** - Physical Damage Coverage:

When fire extinguishers are kept in your covered "auto" and any are discharged in an attempt to extinguish a fire, we will pay the lesser of the actual cost of recharging or replacing such fire extinguisher(s).

No deductible applies to this coverage.

O. HIRED AUTO PHYSICAL DAMAGE COVERAGE

The following is added to Paragraph **A.4.** Coverage Extensions of Section **III** - Physical Damage Coverage:

If hired "autos" are covered "autos" for Covered Autos Liability Coverage and if Physical Damage Coverage is provided for any "auto" you own, then the Physical Damage coverages provided are extended to "autos" you lease, rent, hire or borrow from someone other than your "employees", partners or members of their households subject to the following:

1. The most we will pay in any one "loss" is the lesser of:

a. The actual cash value of the "auto";

b. The cost to repair or replace the "auto"; or

c. $100,000.

2. Paragraph **1.** above is subject to a deductible. The deductible shall be equal to the amount of the highest deductible shown for any owned "auto" of the same classification for that coverage. In the event there is no owned "auto" of the same classification, the highest deductible for any owned "auto" will apply for that coverage.

No deductible will apply to "loss" caused by fire or lightning.

3. Hired Auto Physical Damage Coverage is subject to the following:

a. If symbol 8 is shown in the Covered Auto section of the Declarations page for any of the Physical Damage coverages, then the Hired Auto Physical Damage coverage described in this endorsement does not apply.

b. Other than indicated in Paragraphs **a.** directly above, coverage provided under this provision will be excess over any other collectible insurance or coverage.

4. In addition to the limit set forth in Paragraph **1.** above we will pay up to $500 per day, to a maximum of $3,500 per "loss" for:

a. Any costs or fees associated with the "loss" to a hired "auto"; and

b. Loss of use of the hired "auto", provided it is the consequence of an "accident" for which you are legally liable, and as a result of which a monetary loss is sustained by the leasing or rental concern.

However, Paragraph **A.4.b.** Loss of Use Expenses under Section **III** - Physical Damage Coverage of the Business Auto Coverage Form does not apply.

P. RENTAL REIMBURSEMENT COVERAGE

We will pay for rental reimbursement expenses incurred by you for the rental of an "auto" because of "loss" to a covered "auto".

1. Payment applies in addition to the otherwise applicable amount of each coverage you have on the covered "auto".

2. No deductible applies to this coverage.

3. We will pay only for those expenses incurred during the policy period beginning 24 hours after the "loss" and ending, regardless of the expiration date of the policy, with the lesser of the following number of days:

a. The number of days when the covered "auto" has been repaired or replaced, or

b. 45 days.

4. Our payment is limited to the lesser of the following amounts:

a. Necessary and actual expenses incurred; or

b. Not more than $75 for any one day;

5. We will pay up to an additional $300 for the reasonable and necessary expenses you incur to remove your materials and equipment from the covered "auto" and replace such materials and equipment on the rental "auto".

6. This coverage does not apply while there are spare or reserve "autos" available to you for your operations.

7. If "loss" results from the total theft of a covered "auto" of the "private passenger type", we will pay under this coverage only that amount of your rental reimbursement expenses which is not already provided for under the Physical Damage Coverage Extension of the Business Auto Coverage Form or any endorsements thereto.

However, this provision does not apply to the extent that rental reimbursement is provided by separate endorsement to this policy.

Q. DRIVE OTHER CAR COVERAGE

1. The following is added to Section **II** - Covered Autos Liability Coverage:

a. Any "auto" you don't own, hire or borrow is a covered "auto" for Liability Coverage while being used by:

(1) You, if you are designated in the Declarations as an individual;

(2) Your partners or members, if you are designated in the Declarations as a partnership or joint venture;

(3) Your members or managers, if you are designated in the Declarations as a limited liability company;

(4) Your executive officers if you are designated in the Declarations as an organization other than an individual, partnership, joint venture or limited liability company; and

(5) The spouse of any person named in Paragraphs Q.**1.a.(1).** through Q.**1.a.(4)** while a resident of the same household;

Except:

(a) Any "auto" owned by that individual or by any member of his or her household.

(b) Any "auto" used by that individual or his or her spouse while working in a business of selling, servicing, repairing or parking "autos".

2. Changes In Auto Medical Payments And Uninsured And Underinsured Motorists Coverages

The following is added to **Who Is An Insured**:

Any individual named in **1.a** above and his or her "family members" are "insured" while "occupying" or while a pedestrian when being struck by any "auto" you don't own except:

Any "auto" owned by that individual or by any "family member".

3. Changes In Physical Damage Coverage

Any private passenger type "auto" you don't own, hire or borrow is a covered "auto" while in the care, custody or control of any individual named in **Q.1.a.** above or his or her spouse while a resident of the same house-hold except:

a. Any "auto" owned by that individual or by any member of his or her household; or

b. Any "auto" used by that individual or his or her spouse while working in a business of selling, servicing, repairing or parking "autos".

4. The most we will pay for the total of all damages under Covered Autos Liability Uninsured Motorists Coverage and Underinsured Motorists Coverage is the Limit Of Insurance shown in the Declarations as applicable to owned "autos".

5. Our obligation to pay for, repair, return or replace damaged or stolen property under Physical Damage Coverage, will be reduced by a deductible equal to the amount of the highest deductible shown for any owned private passenger type "auto" applicable to that coverage. If there are no owned private passenger type "autos", the deductible shall be $250 for Comprehensive Coverage and $500 for Collision Coverage. No deductible will apply to "loss" caused by fire or lightning.

6. Additional Definition

As used in this **DRIVE OTHER CAR** Provision:

"Family member" means a person related to the individual named in 1.a. by blood, marriage or adoption who is a resident of the individual's household, including a ward or foster child.

R. KNOWLEDGE OF AN ACCIDENT, CLAIM, SUIT OR LOSS

The following is added to Paragraph **A.2.** of Section **IV** - Business Auto Conditions:

Your obligation to provide prompt notice of an "accident", claim, "suit" or "loss" is satisfied if you or a person designated by you to be responsible for insurance matters is notified of, or in any manner made aware of an "accident", claim, "suit" or "loss" and provides us such notice as soon as practicable

S. WAIVER OF SUBROGATION BY CONTRACT OR AGREEMENT

The following is added to Paragraph **A.5** of Section **IV** - Business Auto Conditions:

We waive any right of recovery we may have against a person or organization because of payments we make for "bodily injury" or "property damage" when you and such person or organization have agreed in writing in a contract or agreement to waive such right of recovery, provided:

1. Such written contract or agreement was:

a. Made prior to the "accident" or "loss" resulting in the covered "bodily injury" or "property damage"; and

b. Was in effect at the time of the covered "bodily injury" or "property damage".

2. The covered "bodily injury" or "property damage" must arise out of the operations specified in such written contract or agreement.

3. At our request you must provide us with a copy of the aforementioned written contract or agreement.

T. UNINTENTIONAL OMISSIONS

The following is added Paragraph **B.2.** of Section **IV** - Business Auto Conditions:

If you fail to disclose any hazards existing at the inception date of this policy, such failure will not prejudice the coverage provided to you. However, this provision does not affect our right to collect additional premium or exercise our right of cancellation or nonrenewal.

U. LIBERALIZATION

If we revise this endorsement to provide greater coverage without additional premium charge, we will automatically provide the additional coverage to all endorsement holders as of the day the revision is effective in your state.

Policy No.: CPA 6040753 - 21

1. SELF-INSURED RETENTION: $ 10,000

2. SCHEDULE OF UNDERLYING INSURANCE

Employers' Liability
Company: Union Insurance Company
Policy Number: 6040753
Policy Period: 07/20/2021 - 07/20/2022
Limits of Insurance:

Bodily injury by accident	$ 1,000,000	Each Accident
Bodily injury by disease	$ 1,000,000	Each Employee
Bodily injury by disease	$ 1,000,000	Policy Limit

Commercial General Liability
Company: Union Insurance Company
Policy Number: 6040753
Policy Period: 07/20/2021 - 07/20/2022
Limits of Insurance:

Each Occurrence	$ 1,000,000
Personal and Advertising Injury Limit	$ 1,000,000
General Aggregate	$ 2,000,000
Products-Completed Operations Aggregate	$ 2,000,000

Commercial Auto Liability
Company: Union Insurance Company
Policy Number: 6040753
Policy Period: 07/20/2021 - 07/20/2022
Limits of Insurance:

Covered Auto Liability - Each Accident	$ 1,000,000

Employee Benefits Liability
Company: Union Insurance Company
Policy Number: 6040753
Policy Period: 07/20/2021 - 07/20/2022
Limits of Insurance:

Each Employee:	$ 1,000,000
Aggregate:	$ 3,000,000

Retroactive Date: 07/20/2020

Policy Number: **CPA 6040753 - 21**

SCHEDULE OF FORMS AND ENDORSEMENTS

The following Declarations, Coverage Forms, Conditions, and Endorsements are applicable to:

Commercial Umbrella

Number	Edition	Description
B CU DS 01	09-2016	Commercial Liability Umbrella Declarations
CL CU FS 01	09-2008	Schedule of Forms and Endorsements
CL CU 10 56	09-2016	Amendment Of Insured Contract Definition
CL CU 21 05	03-2008	Driver Exclusions
CL CU 21 67	01-2007	Exclusion Punitive Damages
CL CU 21 75	01-2007	Exclusion - Lead
CL CU 21 80	01-2007	Exclusion Communicable Disease
CL CU 22 11 WA	09-2016	Asbestos Exclusion
CL CU 22 26 WA	08-2009	Drywall Contaminant Exclusion Endorsement - Washington
CL CU 22 65	03-2015	Exclusion - New Condominium Construction, Design, Development Or Conversion
CL CU 22 76	09-2015	Exclusion - Cyber Liability
CL CU 24 04	01-2007	Changes - Premium Audit
CL CU 24 16	01-2007	Employee Benefits Liability Coverage
CL CU 24 70	09-2016	Additional Insured - Primary Non Contributory
CL CU 24 74	09-2013	Blanket Waiver of Transfer of Rights of Recovery Against Others To Us
CL CU 99 42	06-2008	Contractors Limitation Endorsement
CU 00 01	04-2013	Commercial Liability Umbrella Coverage Form
CU 01 21	09-2000	Washington Changes
CU 01 24	12-2001	Washington Changes - Employment-Related Practices Exclusion
CU 21 05	11-2016	Exclusion - Employees and Volunteer Workers As Insureds
CU 21 17	12-2019	Exclusion - Designated Operations Covered By A Controlled (Wrap-Up) Insurance Program
CU 21 23	02-2002	Nuclear Energy Liability Exclusion Endorsement
CU 21 31	01-2015	Exclusion of Other Acts of Terrorism Committed Outside the United States; Cap on Losses From Certified Acts of Terrorism
CU 21 36	01-2015	Exclusion Of Punitive Damages Related To a Certified Act of Terrorism
CU 21 42	12-2004	Exclusion - Exterior Insulation And Finish Systems
CU 21 50	03-2005	Silica Or Silica-Related Dust Exclusion
CU 21 71	06-2015	Exclusion - Unmanned Aircraft
CU 21 86	05-2014	Exclusion - Access or Disclosure of Confidential Or Personal Information and Data-Related Liability - With Limited Bodily Injury Exception
CU 21 90	11-2016	Public or Livery Passenger Conveyance and On-Demand Delivery Services Exclusion
CU 24 32	04-2013	Limited Coverage Territory
CU 24 36	12-2019	Products-Completed Operations Aggregate Limit Of Insurance
CU 26 77	12-2004	Washington - Fungi Or Bacteria Exclusion

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED - PRIMARY NON CONTRIBUTORY

This endorsement modifies insurance provided under the following:

COMMERCIAL LIABILITY UMBRELLA COVERAGE FORM

Paragraph **5. Other Insurance** of **SECTION IV - CONDITIONS**, **COMMERCIAL LIABILITY UMBRELLA COVERAGE FORM** is replaced with the following:

5. Other Insurance

a. This insurance is excess over, and shall not contribute with any of the other insurance, whether primary, excess, contingent or on any other basis except as shown under **5.c.** below. This condition will not apply to insurance specifically written as excess over this Coverage Part.

When this insurance is excess, we will have no duty under **Coverages A** or **B** to defend the insured against any "suit" if any other insurer has a duty to defend the insured against that "suit". If no other insurer defends, we will undertake to do so, but we will be entitled to the insured's rights against all those other insurers.

b. When this insurance is excess over other insurance, we will pay only our share of the "ultimate net loss" that exceeds the sum of:

(1) The total amount that all such other insurance would pay for the loss in the absence of this insurance; and

(2) The total of all deductible and self-insured amounts under all that other insurance.

c. The insurance is excess of all other insurance available to an additional insured whether on a primary, excess, contingent or any other basis. But if required by a written contract or written agreement to be primary and noncontributory, this insurance will be primary to, and will not seek contribution from, any insurance on which the additional insured is a Named Insured.

No other coverage or limit in the policy applies to loss or damage insured by this coverage.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

BLANKET WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US

This endorsement modifies insurance provided under the following:

COMMERCIAL LIABILITY UMBRELLA COVERAGE PART

The **Transfer Of Rights Of Recovery Against Others To Us** Condition under **Section IV - Conditions** is amended by the addition of the following:

We waive any right of recovery we may have because of payments we make for "bodily injury" or "property damage" arising out of your ongoing operations or "your work" done under a written contract requiring such waiver with that person or organization and included in the "products-completed operations hazard".

However, our rights may only be waived prior to the "occurrence" giving rise to the injury or damage for which we make payment under this Coverage Part. The insured must do nothing after a loss to impair our rights. At our request, the insured will bring "suit" or transfer those rights to us and help us enforce those rights.

COVER SHEET

☒ New Agreement/Contract

☐ Amendment/Change/Extension to _____

☐ Other _____

Originating County Department: Finance

Other party to contract/agreement: Apex Mechanical, LLC

Description:

Approval of a Contract with Apex Mechanical, LLC, For the Public Safety Training Center MAU and Exhaust Replacement project.

After recording please return to: Jennifer Johnson, Finance, jjohnson@clackamas.us

☐ County Admin

☐ Procurement

If applicable, complete the following:

Board Agenda Date/Item Number: _____

Clear Print