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CONSTRUCTION SERVICES CONTRACT

Contract # TR26001CC

THIS CONTRACT is made and entered into by and between YAMHILL COUNTY, a political subdivision of the State of Oregon, acting by and through Yamhill County Transit Area, a County Service District and hereinafter referred to as the "County", and Blue Spruce Builders, Inc. an Oregon corporation whose Federal Employer Identification No. is 203796206, hereinafter referred to as the "Contractor".

RECITALS

WHEREAS, The County requires the services of a construction services contractor for the Durham Lane Tenant Improvement Project (the "Project"); and

WHEREAS, The Contractor possesses the knowledge, qualifications, and experience to perform the work required for, the Project; and

WHEREAS, A procurement of the construction services described herein was done in compliance with ORS 279C and YCR Division 49; and

NOW, THEREFORE, in consideration of the promises and the mutual covenants and conditions set forth herein, and for other good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, it is hereby agreed by the parties as follows:

AGREEMENT

1. COMMENCEMENT AND COMPLETION DATE. An intent to award letter was sent to Blue Spruce Builders, Inc on June 11, 2025. This Contract shall become effective, and the Work required hereunder shall commence, upon the County's issuance of a *Notice to Proceed*. The Work must be completed no later than June 1, 2026, unless the deadline is extended or otherwise modified pursuant to Section 8.

   Penalty For Failure to Meet Deadline. The parties agree that the County has a substantial interest in the timely completion of the Project and all Work to be performed under this Contract in accordance with the agreed upon schedule. However, the parties agree that the damages to be anticipated from the failure of the Contractor to complete Work under this Contract in the specified time are uncertain and difficult to establish. The parties therefore desire to liquidate the County's damages for the Contractor's failure to complete the Project and all Work on time. The parties therefore agree that the Contractor is liable for and shall pay as liquidated damages to the County the sum of $1,340.00 (equal to the Contract's not-to-exceed amount multiplied by .005) per day for each calendar day to commence on the first calendar day after the required completion date under this Contract and to continue after each and every calendar day until all work is satisfactorily completed as specified in the Contract Documents. **Refer to Addendum#1 of IFB** updated schedule-Contractor schedule for relocation of staff during construction is December 1, 2025, to February 28, 2026.

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2. CONSIDERATION. As consideration for the performance of all terms and conditions set forth in this Contract, the County shall pay the Contractor a sum not to exceed **$ 268,000.** The County shall make payment upon receipt and acceptance of the services as invoiced by the Contractor. The County shall pay invoices within thirty (30) days after an invoice has been received and approved by the authorized a County representative.
    a. The compensation provided herein which includes payment for completion of the Base Bid services and completion of Alternate 1 and Alternate 3 as set forth in Contractor's solicitation response, attached hereto as **Exhibit A** and incorporated by this reference herein, shall be exclusive, and the County shall neither pay nor provide Contractor with any fringe benefits, including, but not limited to, retirement, health insurance, workers' compensation insurance, unemployment insurance, or sick leave. No additional compensation or alternate form thereof shall be payable by the County to the Contractor for any purpose whatsoever unless otherwise agreed in writing. The Contractor shall be responsible for paying all income taxes, Social Security or self-employment taxes and any other taxes or assessments imposed by any governmental body incurred by reason of the County's payment of compensation hereunder to Contractor.

3. WORK TO BE PERFORMED BY THE CONTRACTOR. The Contractor agrees to perform, to the satisfaction of the County, the Work as detailed in the Project's design, plans, and specifications (the "Contract Documents"), attached hereto as **Exhibit B** and incorporated by this reference herein. "Work" means the construction and any related services required by or reasonably inferred from the Contract Documents, whether completed or partially completed, including (except as otherwise expressly stated in this Contract) all other labor, materials, equipment, tools, permits, fees, licenses, facilities, taxes, transportation, supervision, temporary constructions of every nature, and all other services, management, and facilities of every nature whatsoever necessary to fulfill the Contractor's duties herein within the term of the Contract.
    a. Additional Work Obligations. Additional Work obligations of the Contractor include the following:
        i. The Contractor shall obtain and pay for all necessary permits and licenses, except for those specifically excluded in the Contract Documents, including, but not limited to, permits and licenses required for the construction of the Work, for temporary obstructions, enclosures, opening of streets for pipes, walls, utilities, environmental work, and others as required for the Project. The Contractor shall be responsible for all violations of the law in connection with the construction or caused by obstructing streets, sidewalks or otherwise. The Contractor shall give all requisite notices to public authorities. The Contractor shall pay all royalties and license fees. The Contractor shall defend all suits or claims for infringement of any patent or other proprietary rights and save harmless and blameless from loss, on account thereof, Yamhill County, and its departments, divisions, members and employees.
        ii. The 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 County and who shall represent the Contractor on the site.

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Directions given to the superintendent by the County's authorized representative shall be confirmed in writing provided to the Contractor by the County.

iii. The Contractor shall prepare, review for compliance with the Contract Documents, approve, and submit to the County 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 County or of separate contractors.

iv. The Contractor shall confine equipment, storage of materials, and operation of Work to the limits indicated by Contract Documents, law, ordinances, permits, or directions of the County's authorized representative. The Contractor shall follow the County's authorized representative's instructions regarding use of premises, if any.

v. In addition to abiding by the terms and conditions stated herein, the Contractor shall abide by and conform to all obligations asserted by the Contractor in their solicitation response, attached hereto as Exhibit B and incorporated herein. If any discrepancy exists between a provision in this Contract and a provision in Exhibit A & B**,** the provisions of this Contract shall prevail.

4. WARRANTY OF WORK. Neither the final payment nor any provision of the Contract Documents shall relieve the Contractor from responsibility for defective Work and, unless a longer period is specified, the 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 County, except for latent defects which will be remedied by the Contractor at any time they become apparent. The County shall give the Contractor notice of defects with reasonable promptness. The Contractor shall perform such warranty work within a reasonable time after the County's demand. If the Contractor fails to complete the warranty work within such period as the County determines reasonable, or at any time in the event of warranty work consisting of emergency repairs, the County may perform such work, and the Contractor shall reimburse the County all costs of the same within ten (10) days after demand without affecting the Contractor's obligations.

5. INDEPENDENT CONTRACTOR. This agreement is not a contract of employment. The County does not seek to hire Contractor as an employee(s) of the County nor does the Contractor desire to be an employee(s) of the County for performance of the services described herein. The parties intend that the Contractor, in performing the services specified herein, shall be and act as an independent contractor and shall have professional control of the work and the manner in which it is performed. The Contractor shall have the sole authority to determine the manner and means of performing the services described herein, and the County shall not interfere with, control, or direct the manner or method in which such services are performed; provided, the County shall direct Contractor as to the work to be assigned and shall have the right to direct the required results to the extent such direction may be consistent with the nature of the Contractor's services. The Contractor shall not be considered an agent of the County, and the County shall not be responsible for any claims, demands, or causes of action of any kind or character arising in favor of any person, on account of personal injuries, or death, or damage to property occurring, growing out of,

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incident to, or resulting directly or indirectly from the operations or activities of the Contractor.

6. THE COUNTY'S RESPONSIBILITIES.
   a. Cynthia Thompson, Transit Manager is the "Project Supervisor" for the County. The County shall provide contract administrative services for the Project through the Project Supervisor. The Project Supervisor may engage and delegate authority to such additional staff and professional and technical consultants as the County deems necessary to assist in performing its administrative tasks. The Contractor shall direct all Project communications to the County in accordance with the Contract Documents, or as the County directs in writing.
   b. The Project Supervisor, and any designee, shall have free access to the Work and the job site at all times. The Contractor shall not carry-on Work except with the knowledge of the County and its Project Supervisor. The County may require special inspection or testing of any portion of the Work, whether it has been fabricated, installed, or fully completed. Inspection or observation of Work shall not relieve the Contractor from any obligations herein. The Project Supervisor, and any designee, has authority to reject or accept any Work that does not conform to the Contract Documents.
   c. Except for those permits and fees that are the Contractor's responsibility under the Contract Documents, the County shall secure and pay for all other necessary approvals, easements, assessments, and charges required to complete the Work.

7. SUBCONTRACTORS.
   a. The County reserves the right to reject any subcontractor proposed that was not included in the Contractor's quote. Further, the Contractor shall not retain a subcontractor to which the County has a reasonable objection.
   b. The Contractor shall pay all subcontractors as required by the Contractor's contracts with those subcontractors. The Contractor agrees that the County has no direct or indirect contractual obligation or other legal duty whatsoever to pay the subcontractors of the Contractor or otherwise ensure that the Contractor makes full and timely payment to those subcontractors for services performed on the Project.
   c. The Contractor covenants and agrees to bind any and all subcontractor(s) for performance of Work under this Contract. Any reference to the Contractor herein shall include any and all subcontractor(s) ad infinitum.

8. CONTRACT MODIFICATIONS. Unless otherwise stipulated in the Contract Documents attached hereto, the County may modify this Contract as follows:
   a. Minor Changes in the Work. The County may, at its discretion, issue a "Field Order" or "Supplemental Instructions" authorizing minor changes in the Work performed under the Project, so long as the changes do not involve adjustment to the Contract sum or the Contract time. These minor changes may include details to clarify the work to be performed. Via e-mail or letter, the Contractor must acknowledge receipt of instruction authorizing minor changes in the Work and incorporate these changes in the as-built drawings.
   b. Change Order Procedures. Either the County or the Contractor may initiate a request for proposed changes in Work to be performed under the Project via a "Change

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Order." For all proposed changes, a Change Order form must be used to record the proposed changes to the Project. The Change Order must contain a description of all changes in work, a detailed accounting of the proposed change in total cost, and an outline of any changes in the Project's schedule. The Contractor must then sign form and submit it to the County for final approval and authorization.

c. Amendments. This Contract may be amended to the extent permitted by applicable statutes, administrative rules, ordinances, and the Yamhill County Public Contracting Rules. For anticipated amendments, this Contract may be amended only in accordance with and to the extent provided in the original solicitation document. No amendment shall bind either party unless in writing and signed by both parties.

9. COMPLIANCE WITH ORS 279B.220. For all services provided under this Contract, the Contractor shall: (i) pay promptly, as due, all persons supplying labor or material; (ii) pay all contributions or amounts due the Industrial Accident Fund from the Contractor or any subcontractor; (iii) not permit any lien or claim to be filed or prosecuted against the County or any subdivision thereof; and (iv) pay to the State of Oregon Department of Revenue all sums withheld from employees pursuant to ORS 316.167. If the Contractor does not pay promptly any claim that is due for the services furnished to the Contractor by any subcontractor in connection with this Contract, the County may pay such claim and charge that payment against any payment due to the Contractor under this Contract. The County's payment of a claim does not relieve the Contractor or its surety, if any, from their obligations for any unpaid claims.

10. HOURS OF LABOR; COMPLIANCE WITH PAY EQUITY PROVISIONS.

a. Pursuant to ORS 279B.235(3), the Contractor shall pay the Contractor's employees who perform work under this Contract at least time and a half for all overtime in excess of 40 hours a week, and for work performed on any legal holiday as specified in ORS 279B.020, except for employees who are excluded under ORS 653.010 to 653.261 or under 29 U.S.C. 201 to 209 from receiving overtime.

b. Pursuant to ORS 279B.235(1)(b), the Contractor shall comply with the prohibition set forth in ORS 652.220. Such compliance is a material element of this Contract and failure to comply is a breach that entitles the County to terminate the Contract for cause.

c. Pursuant to ORS 279B.235(1)(c), the Contractor shall not prohibit any of the Contractor's employees from discussing the employee's rate of wage, salary, benefits or other compensation with another employee or another person and may not retaliate against an employee who discusses the employee's rate of wage, salary, benefits or other compensation with another employee or another person.

d. Pursuant to ORS 279B.235(5)(b), the Contractor shall notify, in writing, any person employed by the Contractor under this Contract, either at the time of hire or before work begins on the Contract, or by posting a notice in a location frequented by employees, of the number of hours per day and days per week that the Contractor may require the employees to work.

11. WORKERS' COMPENSATION. If the Contractor is a subject employer for workers' compensation or unemployment insurance purposes, Contractor shall provide such workers' compensation and unemployment coverage benefits at its sole cost and expense and shall

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provide proof of such insurance and benefits at the County's request. The parties hereto specifically agree that this Contract will render the Contractor and the Contractor's employees, if any, ineligible for benefits under ORS 656.029 and that the County shall not be liable for, responsible for, or in any way or manner be required to provide, workers' compensation benefits for the Contractor or the Contractor's employees.

12. COMPLIANCE WITH LAWS. The Contractor shall comply with all federal, state, and local laws, codes, regulations and ordinances applicable to the provision of services under this Contract, including, without limitation, the provisions of: (i) Title VI of the Civil Rights Act of 1964; (ii) Section V of the Rehabilitation Act of 1973; (iii) the Americans with Disabilities Act of 1990 (Pub L No 101- 336), ORS 659.425, and all amendments of and regulations and administrative rules established pursuant to those laws; and (iv) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules, and regulations. Any violation by Contractor of any applicable law required in the provision of services hereunder shall constitute breach of this Contract, and Contractor shall be solely liable for any and all claims arising out of, connected with, or as a result of the violation.

13. COMPLIANCE WITH PROCUREMENT STATUTES. The Contractor shall comply with the following statutory regulations pertaining to public construction contracts:
    a. The Contractor shall make payment promptly, as due, to all persons supplying to the Contractor labor or material for the performance of the Work provided for in this Contract. ORS 279C.505(1)(a).
    b. The Contractor shall pay all contributions or amounts due the Industrial Accident Fund from the Contractor or first-tier subcontractor incurred in the performance of this Contract. ORS 279C.505(1)(b).
    c. The Contractor shall not permit any lien or claim to be filed or prosecuted against the state or a county, school district, municipality, municipal corporation or subdivision thereof, on account of any labor or material furnished. ORS 279C.505(1)(c).
    d. The Contractor shall pay to the Department of Revenue all sums withheld from employees under ORS 316.617. ORS 279C.505(1)(d).
    e. The Contractor shall demonstrate upon request that an employee drug testing program is in place. ORS 279C.505(2).
    f. The Contractor shall salvage or recycle construction and demolition debris if feasible and cost effective. In contracts for lawn and landscape maintenance, the Contractor shall compost or mulch yard waste material at an approved site if feasible and cost-effective. ORS 279C.510(1).
    g. The Contractor and any subcontractor shall promptly pay, as due, all persons supplying labor and services furnished to the Contractor or first-tier subcontractor by any person in connection with this Contract as the claim becomes due. If the Contractor or subcontractor fails to pay any such claim, the County may pay the claim and charge the payment against the funds due or to become due the Contractor by reason of the Contract. ORS 279C.515(1).
    h. The Contractor and/or any first-tier subcontractor shall make payment to any person furnish labor or materials in connection with this Contract within 30 days after receipt of payment from the County or the Contractor. The Contractor or first-tier subcontractor shall owe the person the amount due plus interest charges

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commencing at the end of the 10-day period that payment is due under ORS 279C.580(4) and ending upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest charged to the Contractor or first-tier subcontractor on the amount due shall equal three times the discount rate on 90-day commercial paper in effect at the Federal Reserve Bank in the Federal Reserve district that includes Oregon on the date that is 30 days after the date when payment was received from the contracting agency or from the Contractor, but the rate of interest may not exceed 30 percent. The amount of interest may not be waived. ORS 279C.515(2).

i. The Contractor or any subcontractor shall make payment to any person furnishing labor or materials in connection with this 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. ORS 279C.515(3).
j. The Contractor and any subcontractor shall comply with all applicable provisions of federal, state or local statutes, ordinances and regulations dealing with the prevention of environmental pollution and the preservation of natural resources that affect the Work under the Contract. ORS 279C.525.
k. The Contractor shall promptly, as due, make payment to any person, co-partnership, association or corporation furnishing medical, surgical and hospital care services, or the needed care and attention incident to sickness or injury, to the employees of the Contract, of all sums that 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, pursuant to ORS 279C.530(1).
l. If the Contractor is a subject employer, the Contractor shall comply with ORS 656.017. ORS 279C.530(2).
m. No person shall be employed by the Contractor for more than ten hours in any one day, or 40 hours in any one week, except in cases of necessity, emergency, or where public policy absolutely requires it, and in such cases the laborer shall be paid at least time-and-a-half pay for all overtime in excess of 40 hours a week and for Work performed on any legal holiday specified in ORS 279C.540.
n. The Contractor shall comply with maximum hours of work, holidays and overtime per ORS 279C.540 and time limit on claims for overtime per ORS 279C.545.
o. The Contractor shall comply with ORS 279C.550 through 279C.570 regarding withholding of retainage. The withholding of retainage by the Contractor shall be in accordance with ORS 701.420 and 701.430.
p. The Contractor shall comply with ORS 279C.570 regarding prompt payment, progress payments, and rate of interest.
q. The 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: (i) a payment clause that obligates the Contractor to pay the first-tier subcontractor for satisfactory performance under its subcontract within 10 days out of such amounts as are paid to the Contractor by the County; and (ii) an interest penalty clause that obligates the Contractor, if payment is not made within 30 days after receipt of payment from the contracting agency, to pay to the first-tier subcontractor an interest penalty on amounts due in the case of each payment not made in accordance with the payment clause included in the

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subcontract. These clauses must also be included in each of the Contractor's subcontracts and in each of the first-tier subcontractor's subcontracts and each of the first-tier subcontractor's, subcontractors shall include these clauses in their subcontracts with each lower-tier subcontractor or supplier. ORS 279C.580.

r. The Contractor and any subcontractor shall comply with ORS 279C.605 regarding Notice of Claim.

s. The Contractor shall not discriminate against a disadvantaged business enterprise, a minority-owned business, a woman-owned business, a business that a service-disabled veteran owns or an emerging small business, in the awarding of subcontracts. ORS 279A.110

t. Unless contrary to federal law, the Contractor shall not accept a bid from Subcontractors to perform Work as described in ORS 701.005 under this Contract unless such subcontractors are registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time they submit their bids to the Contractor.

u. Unless contrary to federal law, the Contractor shall certify that each landscape contractor, as defined in ORS 671.520(2), performing Work under this Contract holds a valid landscape contractor's license issued pursuant to ORS 671.560.

v. 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 (503)232-1987.

14. PREVAILING WAGE REGULATIONS.

a. This Contract is subject to the following Bureau of Labor and Industries (BOLI) wage requirements and the prevailing wages rates set forth in the following booklet, as amended, which is incorporated herein by reference with the same force and effect as though fully set forth herein, and is available at the following web link:

http://www.oregon.gov/boli/WHD/PWR/Pages/pwr_state.aspx

- Prevailing Wage Rates for Public Works Contracts in Oregon issued January 5, 2025.
- Prevailing Wage Rates Apprenticeship Rates issued January 5, 2025.

b. The Contractor shall provide the County with a copy of the certified payroll weekly for recording purposes. ORS 279C.860; OAR 839-025-0010

c. The Contractor and every subcontractor must have a public works bond filed with the Construction Contractors Board before starting work on the project, unless exempt. ORS 279C.830(2); OAR 839-025-0020(e)

d. Workers employed under this Contract shall be paid not less than the applicable state prevailing rate of wage. ORS 279C.830(1)(c); OAR 839-025-0020(3)(a)

e. If the project is subject to both the state prevailing wage rate law and the federal Davis-Bacon Act, the Contractor shall pay the higher of the applicable state or federal prevailing rate of wage. ORS 279C.830(1)(b); OAR 839-025-0020(4)(c)

f. If the Contractor fails to pay for labor and services, the County can pay for them and withhold these amounts from payments to the Contractor. ORS 279C.515; OAR 839-025-0020(2)(a)

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g. The Contractor must pay daily, weekly, weekend and holiday overtime as required in ORS 279C.540. ORS 279C.520(1); OAR 839-025-0020(2)(b)
h. The employer must give written notice to the workers of the number of hours per day and days per week they may be required to work. ORS 279C.520(2); OAR 839-025-0020(2)(c)
i. The Contractor must make prompt payment for all medical services for which the Contractor has agreed to pay, and for all amounts for which the Contractor collects or deducts from the worker's wages. ORS 279C.530; OAR 839-025-0020(2)(d)
j. The Contractor must include in every subcontract a provision requiring the subcontractor to have a public works bond filed with the Construction Contractors Board before starting work on the project, unless exempt. ORS 279C.830(2)(b); OAR 839-025-0020(2)(e)(B)
k. The Contractor shall certify that all subcontractors performing work described in ORS 701.005(2) will be registered with the Construction Contractors Board or licensed by the State Landscape Contractors Board in accordance with ORS 701.035 to 701.055 before the subcontractors commence work under the Contract.

15. RETAINAGE BY THE COUNTY. The County may reserve as retainage from any progress payment an amount not to exceed five (5) percent of the payment. As Work progresses, the County may reduce the amount of the retainage and may eliminate retainage on any remaining monthly Contract payments after 50 percent of the Work under the Contract is completed if, in the County's opinion, such Work is progressing satisfactorily. Any retainage reserved by the County shall be withheld and released in accordance with ORS 279C.550 to 279C.580.
    a. If the Contract exceeds $500,000, the County may place amounts deducted as retainage into an interest-bearing escrow account, and if it does, any interest on the retainage amount will be paid to the Contractor. In accordance with ORS 279C.5570(2), such interest shall accrue from the date the payment request is approved by the County until the date the retainage is paid to the Contractor to which it is due.

16. INDEMNIFICATION. The Contractor shall defend, indemnify, and hold harmless the County, its officers, agents, and employees from any claims, liabilities, demands, damages, actions, or proceedings arising from or relating to the acts or omissions of the Contractor in connection with the performance of any services required hereunder. The Contractor shall be responsible for any damage to property, injury to persons, and any loss, expense, inconvenience, and/or delay that may be caused by, or result from, the carrying out of services under this Contract.
    a. Environmental Contamination. The Contractor will be held responsible for and shall indemnify, defend (with counsel of the County's choice) and hold harmless the County from and against any costs, expenses, damages, claims, and causes of action, including attorney fees, 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 Contract which occur as a result of, or are contributed to, 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.

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17. RISK OF LOSS. The risk of loss or damage to the subject matter of this Contract arising from any cause whatsoever, including acts of God, shall be upon the Contractor until such time as the County has accepted the work and services as provided in this Contract.

18. INSURANCE. The Contractor shall, at its expense, obtain the following insurance coverage and keep them in effect during the entire term of this Contract:
    a. Comprehensive General Liability Insurance (including contractual liability and completed operations coverage) with a per occurrence limit of not less than $2,000,000 and an aggregate limit of not less than $4,000,000, covering all activities and operations of the Contractor;
    b. Commercial Automobile Liability Insurance, with a per occurrence limit of not less than $2,000,000 and an aggregate limit of not less than $4,000,000, for all owned, non-owned, and hired vehicles used in the performance of the services required hereunder; and
    c. Additional Insurance Requirements:
        i. All insurance policies shall be written on an occurrence basis and be in effect for the term of this Contract. Written authorization from the County is required for any insurance policy written on a claims-made basis. Any insurance policy authorized to be written on a claims-made basis shall be in effect for the term of this Contract plus for three (3) years after the termination of this Contract.
        ii. Insurance coverage shall apply on a primary and non-contributory basis.
        iii. Prior to commencing services, the Contractor shall furnish current Certificate(s) of Insurance for all required insurance to the County. The insurance must be provided by an insurance company or entity that is authorized to transact the business of insurance and issue coverage in the State of Oregon, with an AM best rating of at least A-. The Certificate shall provide, by policy endorsement, if necessary, that the County, it's officers, employees, agents, and volunteers are additional insureds with respect to the Contractor's services provided under this Contract and that there shall be no cancellation, termination, non-renewal, material change to, potential exhaustion of aggregate limits, or reduction of limits of the required insurance without at least 30 days written notice from the Contractor or its insurer to the County. If requested, the Contractor shall provide complete copies of insurance policies to the County.

19. BONDS REQUIRED.
    a. Performance and Payment Security. The Contractor shall furnish bonds issued by a surety approved by the County covering faithful performance of this Contract and payment of obligations arising thereunder. The cost of the bonds shall be equal to 100 percent of the Contract's total not-to-exceed amount. The Contractor shall deliver the required bonds to the County not later than the date of execution of the Contract, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to commencement of the Work, submit evidence satisfactory to the County that such bonds will be furnished. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety

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to affix thereto a certified and current copy of the power of attorney. Upon request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

b. Public Works Bond. Throughout the term of the Contract, the Contractor shall have on file with the Construction Contractors Board a public works bond in compliance with ORS 279C.836 and OAR 839-025-0015, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring a 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 the subcontractor to start Work.

20. TERMINATION.

a. County's Termination for Convenience. The County may terminate this Contract in whole or in part whenever the County determines that termination of the Contract is in the best interest of the County. The County will provide the Contractor with written notice of a termination for convenience at least thirty (30) calendar days before the intended termination date. By the termination date, the Contractor shall provide the County with immediate and peaceful possession of the Project site. Such termination shall be without liability or penalty, and in no circumstance shall Contractor be entitled to lost profits for work not performed due to termination. No termination for convenience shall prejudice any obligations or liabilities of either party already accrued prior to the effective date of termination.

b. County's Termination for Cause. The County may immediately terminate this Contract without liability or penalty for either of the following causes by the mailing of written notice to the Contractor at the Contractor's address provided herein, specifying the cause:

   i. The Contractor breaches any of the provisions of this Contract;
   ii. The Contractor no longer holds all licenses or certificates that are required to perform the services required under this Contract;
   iii. The County lacks lawful funding, appropriations, limitations, or other expenditure authority at levels sufficient to allow the County, in the exercise of its reasonable discretion, to pay for the Contractor's services; or
   iv. Federal, state, or local laws, regulations, or guidelines are modified or interpreted in such a way that either the services under this Contract are prohibited, or the County is prohibited from paying for such services from the planned funding source.

c. Contractor's Termination for Cause. The Contractor may terminate this Contract for cause if the County fails to pay the Contractor pursuant to this Contract. The Contractor may also terminate this Contract for cause if the County commits any material breach or default of any covenant, warranty, obligation, or agreement under this Contract and such breach or failure is not cured within thirty (30) calendar days after delivery of the Contractor's notice, or such longer period as the Contractor may specify in such notice.

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21. FORCE MAJEURE. Neither the County nor the Contractor shall be held responsible for delay or default caused by fire, riot, civil disobedience, acts of God, or war where such cause was beyond the reasonable control of the County or the Contractor. The Contractor shall, however, make all reasonable efforts to remove or eliminate such a cause of delay or default and shall, upon the cessation of the cause, diligently pursue performance of its obligations under this Contract. The risk of loss or damage to the subject matter of this agreement shall be upon the Contractor until such time as the County has accepted the services required hereunder.

22. ASSIGNMENT; DELEGATION; SUCCESSOR. The Contractor shall not assign, delegate, nor transfer any of its rights or obligations under this Contract without the County's prior written consent. The County's written consent does not relieve the Contractor of any obligations under this Contract, and any assignee, transferee, or delegate is considered the Contractor's agent. The provisions of this Contract shall be binding upon and shall inure to the benefit of the parties to the Contract and their respective successors and assigns.

23. GOVERNING LAW, JURISDICTION, VENUE, & ATTORNEY FEES. This Contract shall be governed and construed in accordance with the laws of the State of Oregon, without resort to any jurisdiction's conflict of laws rules or doctrines. Any claim, action, suit, or proceeding (collectively, "the claim") between the County (and/or any other agency or department of Yamhill County) and the Contractor that arises from or relates to this Contract shall be brought and conducted solely and exclusively within the Circuit Court of Yamhill County for the State of Oregon. Provided, however, if the 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. The Contractor hereby consents to the *in personam* jurisdiction of said courts. Each party shall be responsible for the party's own attorney fees, costs, and disbursements at all times including appeals.

24. RECORDS. The Contractor shall maintain all fiscal records relating to this Contract in accordance with generally accepted accounting principles. In addition, the Contractor shall maintain any other records pertinent to this Contract in such a manner as to clearly document the Contractor's performance hereunder. The Contractor acknowledges and agrees that the County, the Oregon Secretary of State's Office, the Federal Government and their duly authorized representatives shall have access to such fiscal records and all other documents that are pertinent to this Contract for the purpose of performing audits and examinations and making transcripts and excerpts. All such fiscal records and pertinent documents shall be retained by the Contractor for a minimum of six (6) years (except as required longer by law) following final payment and termination of this Contract, or until the conclusion of any audit, controversy or litigation arising out of or related to this Contract, whichever date is later.

25. NOTICES. All notices, bills, and payments shall be made in writing and may be given by personal delivery or by mail. Notices, bills, and payments sent by mail should be addressed as follows:

County: Yamhill County Transit
ATTN: Cynthia Thompson

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535 NE 5th Street
McMinnville, Oregon 97128
thompsonc@yamhillcounty.gov

Contractor: Blue Spruce Builders, Inc.
ATTN: Richard Moore
4600 Perrydale Rd
Dallas, Oregon 97338
rich@bluesprucebuilders.com

26. FOREIGN CONTRACTOR. If the Contractor is not domiciled in or registered to do business in the State of Oregon, the Contractor shall promptly provide to the Oregon Department of Revenue and the Secretary of State Corporation Division all information required by those agencies relative to this Contract. The County shall withhold final payment under this Contract until the Contractor has met this requirement.

27. TAX CERTIFICATION. The Contractor hereby certifies that it is not in violation of any Oregon Tax Laws and that it shall continue to comply with Oregon Tax Laws during the term of this Contract. Pursuant to ORS 279B.045, the Contractor's failure to comply with the Oregon Tax Laws is considered a default for which the County may terminate the Contract and seek damages and other relief as available. For purposes of this certification, "Oregon Tax Laws" means those programs listed in ORS 305.380(4).

28. WAIVER. The failure of either party to enforce any provision of this Contract shall not constitute a waiver by that party of that or any other provision of this Contract, or the waiver by that party of the ability to enforce that or any other provision in the event of any subsequent breach.

29. ENTIRE AGREEMENT. This Contract constitutes the entire agreement between the parties on the subject matter hereof. No waiver, consent, modification or change of terms or provisions of this agreement shall bind either party unless in writing and signed by both parties. Such waiver, consent, modification, or change, if made, shall be effective only in the specific instance and for the specific purpose given. There are no understandings, agreements, or representations, oral or written, not specified herein regarding this agreement.

30. COUNTERPARTS. This Contract and any subsequent amendments may be executed in any number of counterparts (including by facsimile, PDF, or other electronic transmission), each of which so executed shall be deemed to be an original, and such counterparts shall together constitute one agreement binding on all parties.

31. SEVERABILITY. If any provision of this Contract shall be held invalid or unenforceable by any court or tribunal of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provision, and the obligations of the parties shall be construed and enforced as if the Contract did not contain the particular term or provision held to be invalid.

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32. SURVIVAL. All rights and obligations shall cease upon termination of this Contract, except for those rights and obligations that by their nature or express terms survive termination of this agreement. Termination shall not prejudice any rights or obligations accrued to the parties prior to termination.

THIS AGREEMENT CONSTITUTES THE ENTIRE AGREEMENT BETWEEN THE PARTIES. NO WAIVER, CONSENT, MODIFICATION OR CHANGE IN TERMS OF THIS AGREEMENT SHALL BIND EITHER PARTY UNLESS IN WRITING AND SIGNED BY BOTH PARTIES. SUCH WAIVER, CONSENT, MODIFICATION OR CHANGE, IF MADE, SHALL BE EFFECTIVE ONLY FOR THE SPECIFIC INSTANCE AND FOR THE SPECIFIC PURPOSE GIVEN. THERE ARE NO UNDERSTANDINGS, AGREEMENTS OR REPRESENTATIONS, ORAL OR WRITTEN NOT SPECIFIED HEREIN REGARDING THIS AGREEMENT. THE CONTRACTOR, BY SIGNATURE OF ITS AUTHORIZED REPRESENTATIVE, HEREBY ACKNOWLEDGES THAT HE/SHE HAS READ THIS AGREEMENT, UNDERSTANDS IT, AND AGREES TO BE BOUND BY ITS TERMS AND CONDITIONS.

[remainder of page intentionally blank; signature page follows]

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IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed, this Contract on the date indicated by their duly authorized officials.

CONTRACTOR

DocuSigned by:
Richard Moore
17ED6F3B0667418...
Signature

Richard Moore
Name (printed)

President
Title

10/22/2025
Date

YAMHILL COUNTY

DocuSigned by:
Kit Johnston
8E58DDAC84AB478...
Chair, KIT JOHNSTON

DocuSigned by:
Mary Starrett
8E58DDAC84AB478...
Commissioner, MARY STARRETT

Signed by:
David "Bubba" King
8E58DDAC84AB478...
Commissioner, DAVID (BUBBA) KING

11/4/2025
Date

APPROVED AS TO FORM:

By: DocuSigned by:
Christian Boenisch
42D9EF9444634DC...
CHRISTIAN BOENISCH,
COUNTY COUNSEL

Approved by the BOC on: 10/30/2025
via Board Order No.: 25-352

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

EXHIBIT A: TRB25001CB
PRICING SUBMITTAL FORM

Pricing Submittal Instructions. Offerors shall enter pricing and other required information for all bid Items listed in this Pricing Submittal Form. If this Pricing Submittal Form is replaced by a formal amendment issued via an Addendum, Offerors shall use the amended form to provide pricing and other required information. If the Pricing Submittal Form is only modified by an Addenda, Offerors shall follow the instructions in the Addenda for making modifications to the Pricing Submittal Form. Failure to supply the required information in the Pricing Submittal Form or subsequent Addenda may result in bid rejection as non-responsive.

Base Bid, Single-Prime (All Trades) Contract. The undersigned Offeror, having carefully examined the ITB, including the General Conditions, Drawings, Specifications, and all subsequent Addenda, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the Yamhill County Transit Operations Center Tenant Improvement Project according to the requirements of ITB, for the stipulated sum of:

TOTAL BASE BID – LUMP SUM: $ 125,000.00

Alternates (Bid on All Alternates)

The following items of work are listed as Alternates on the Bid Forms and drawings. The specifications and drawings for each of these alternates have been included in the attached IFB drawings and specification sheet. The bid should include all labor, materials, shipping, fees, and markups, O&M per specifications, training, etc. to have a fully operational scope.

Each of the three alternates are additive to the base bid and will require a bid that is separate from the base bid on the pricing submittal form (Exhibit A of the Bid Document). The pre-proposal conference (June 16, 2025, 2pm) will include a specific overview of each of the three alternates and their associated scope. We hope to be able to address any specific questions or clarifications you have regarding the alternates themselves, their scope, their relationship to the base bid or bid pricing at that time. Minutes of the meeting will be sent to all participants.

Please note that the alternates quoted on the Bid Forms in Bidding Requirements will be reviewed and accepted or rejected at the option of Yamhill County Transit. Accepted alternates will be identified in the Owner/Contractor Agreement.

Alternate 1 - Extension of existing partial height walls to ceiling and associated HVAC modifications

Alternate 1 - Additive Bid Amount: 33,000

Alternate 2 - New restroom in Shop (Restroom – 124) and associated plumbing.

Alternate 2 - Additive Bid Amount: 62,000

Alternate 3 - Lighting upgrades.

Alternate 3 - Additive Bid Amount: 110,000

Exhibit A Board Order No.: 25-352

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OFFEROR NAME:

Contact Person: Richard Moore

Telephone Number: (503) 930-9888

Email: rich@bluesprucebuilders,com

Fax Number: (_____)_____

Federal ID Number: 203796206

Exhibit A Board Order No.: 25-352

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

EXHIBIT C: TRB25001CB

CERTIFICATIONS & ACKNOWLEDGMENT FORM

CCB REQUIREMENTS

(1) Offerors shall be licensed with the State of Oregon Construction Contractors Board (CCB) prior to bidding on Public Improvement Contracts. FAILURE TO COMPLY WITH THIS REQUIREMENT SHALL RESULT IN BID REJECTION.

(2) All subcontractors participating in the project shall be similarly registered with the Construction Contractors Board at the time they propose to engage in subcontract work. The CCB registration requirements apply to all public works contracts unless superseded by federal law.

Offerors SHALL provide their Construction Contractors Board (ORS 701.055) registration number below:

CONSTRUCTION CONTRACTORS BOARD REGISTRATION NO.: 170814

EXPIRATION DATE OF CCB NO.: 6/22/2026

ASBESTOS ABATEMENT LICENSING REQUIREMENTS

An asbestos abatement license under ORS 468A.720 will not be required of the contractor or its subcontractors.

ADDITIONAL LICENSING REQUIREMENTS

None

RESIDENCY INFORMATION

In determining the lowest responsive bid, the County shall apply the reciprocal preference as set forth in ORS 279A.120 and YCC 3.20.046.0300 – 3.20.046.0330 for a Nonresident Offeror.

"Resident Offeror" means an Offeror that has paid unemployment taxes or income taxes in this state during the 12 calendar months immediately preceding submission of the bid, has a business address in this County, and has stated in the bid whether the Offeror is a "resident Offeror". (ORS 279A.120(b))

"Nonresident Offeror" means an Offeror who is not a "Resident Offeror" as defined above.

a. Check one: Offeror is a: (x) Resident Offeror ( ) Non-resident Offeror

b. If a Resident Offeror, enter your Oregon business address: 4600 Perrydale Rd
Dallas, OR 97338

c. If a Non-resident Offeror, enter state of residency and business address: _____

d. Check one: Offeror is a: (x) Corporation ( ) Non-Profit Organization

FOREIGN CONTRACTOR: If the amount of the contract exceeds ten thousand dollars ($10,000), and if Contractor is not domiciled in or registered to do business in the state of Oregon, Contractor shall promptly provide to the Oregon Department of Revenue all information required by that Department relative to the contract. The County shall be entitled to withhold final payment under the contract until Contractor has met this requirement. (ORS 279A.120(3))

CERTIFICATION OF COMPLIANCE WITH NON-DISCRIMINATION LAWS

By my signature on the Offeror Signature Form, Exhibit D, I certify that I am authorized to act on behalf of Offeror in this matter and that Offeror has not discriminated and will not discriminate against any disadvantaged business enterprise, minority-owned business, women-owned business, emerging small business, or business that a service-disabled veteran owns, in obtaining any required subcontracts. Failure to do so shall be grounds for disqualification.

Exhibit A Board Order No.: 25-352

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

INSURANCE INFORMATION

(1) The awarded contractor may employ workers, and if the awarded contractor employs workers, the awarded contractor must obtain and at all time keep in effect Workers' Compensation insurance. Offeror represents to the County that it presently maintains coverage sufficient to meet the requirements of Oregon law through:

Carrier: SAIF Policy No.: 743946

(2) The awarded contractor must obtain and at all times keep in effect, Commercial General Liability insurance covering activities and operations of the awarded contractor. Commercial general liability shall cover bodily injury, death, and property damage, and shall include personal injury liability, products and completed operation insurance. Such liability insurance, whatever the form, shall carry at least liability coverage sufficient to meet the requirements set forth in the Oregon Tort Claims Act as codified in ORS 30.260 to 30.300. Offeror has obtained insurance required by this section through:

Carrier: Benchmark Insurance Co. Policy No.: BIC5028397

(3) The awarded contractor must maintain Automobile Liability Insurance covering all owned, non-owned, and hired vehicles used in the performance of services awarded under this ITB. Automobile Liability Insurance coverage shall be sufficient to meet the requirements set forth in the Oregon Tort Claims Act as codified in ORS 30.260 to 30.300. Offeror has obtained insurance required by this section through:

Carrier: Oregon Mutual Insurance Co. Policy No.: OMO924459

ADDENDA ACKNOWLEDGEMENT

(1) The County reserves the right to make changes to the Invitation to Bid and the resulting contract, by written Addenda, prior to the closing time and date. Addenda will be available at the address provided in Section B.4.1 of the ITB. The County is not responsible for an Offerors failure to receive notice of Addenda if such are advertised in the foregoing manner. Addenda shall only be issued by the County and upon issuance are incorporated into the Invitation to Bid or the resulting contract.

(2) By Offeror's signature on the Offeror Signature Form, Exhibit D, Offeror ACKNOWLEDGES, AGREES and CERTIFIES TO THE FOLLOWING:

If any Addenda are issued in connection with this ITB, Offeror has received and duly considered such Addenda, and has completed the blanks below identifying all Addenda issued, and acknowledging and agreeing to the terms of all such Addenda as those terms revise the terms, conditions, Plans and Specifications of this ITB.

Addenda: No. 1 to No. 4 inclusive.

CERTIFICATION OF COMPLIANCE WITH TAX LAWS

By my signature on the Offeror Signature Form, Exhibit D, I hereby attest or affirm under penalty of perjury: That I am authorized to act on behalf of the contractor in this matter, that I have authority and knowledge regarding the payment of taxes, and that the contractor is, to the best of my knowledge, not in violation of any Oregon Tax Laws. For purposes of this certification, "Oregon tax laws" are those tax laws imposed by ORS 320.005 to 320.150 and ORS 403.200 to 403.250 and ORS Chapters 118, 314, 316, 317, 318, 321 and 323; the elderly rental assistance program under ORS 310.630 to 310.706; and any local tax laws administered by the Oregon Department of Revenue under ORS 305.620.

CERTIFICATION OF DRUG-TESTING LAW REQUIREMENTS

Pursuant to ORS 279C.505(2), the Offeror certifies by its signature on the Offeror Signature Form, Exhibit D, that it has a Qualifying Drug Testing Program in place for its employees that includes, at a minimum, the following:

a) A written employee drug testing policy;
b) Required drug testing for all new Subject Employees or, alternatively, required testing of all Subject Employees every 12 months on a random selection basis; and
c) Required testing of a Subject Employee when the Offeror has reasonable cause to believe the Subject Employee is under the influence of drugs.

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A drug testing program that meets the above requirements will be deemed a "Qualifying Employee Drug Testing Program." An employee is a "Subject Employee" only if that employee will be working on the Project job site.

If awarded a Public Improvement Contract as a result of this solicitation, the Offeror agrees that at the time of contract execution it shall represent and warrant to the County that its Qualifying Employee Drug Testing Program is in place and will continue in full force and effect for the duration of the Public Improvement Contract. The County's performance obligation (which includes, without limitation, the County's obligation to make payment) shall be contingent on the contractor's compliance with this representation and warranty.

If awarded a Public Improvement Contract as a result of this solicitation, Offeror also agrees that at the time of contract execution, and as a condition to County's performance obligation (which includes, without limitation, the County's obligation to make payment), it shall require each subcontractor providing labor for the Project to:

a) Demonstrate to the contractor that it has a Qualifying Employee Drug Testing Program for the subcontractor's Subject Employees, and represent and warrant to the contractor that the Qualifying Employee Drug Testing Program is in place at the time of subcontract execution and will continue in full force and effect for the duration of the subcontract; or
b) Require that the subcontractor's Subject Employees participate in the contractor's Qualifying Employee Drug Testing Program for the duration of the subcontract.

CERTIFICATION OF COMPLIANCE WITH OREGON PREVAILING WAGE LAWS

By my signature on the Offeror Signature Form, Exhibit D, Offeror certifies that it will comply with the applicable requirements of ORS 279C.800 through 279C.870, and fully understands the provisions thereunder, including, but not limited to, the following:

a) Each worker in each trade or occupation employed in the performance of this project, either by the contractor, subcontractor, or other person doing or contracting to do or contracting for the whole or any part of the work on the project, must be paid not less than the applicable prevailing wage rate.
b) Pursuant to ORS 279C.836, the contractor must file a public works bond with a corporate surety in the amount of $30,000.00 with the Construction Contractors Board before starting work under the contract.
c) Pursuant to ORS 279C.845, the contractor, or the contractor's surety, and every subcontractor, or the subcontractor's surety, must file certified statements with the County in writing, on a form prescribed by BOLI, certifying:
    a. The hourly rate of wage paid each worker whom the contractor or the subcontractor has employed under the contract; and
    b. That no worker employed under the contract has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the contract.
d) The County is required to withhold 25% of amounts to contractors if certified payrolls are not filed by the contractor as required for work performed under this contract.

CERTIFICATION OF COMPLIANCE WITH NON-DISCRIMINATION LAWS

By my signature on the Offeror Signature Form, Exhibit D, I certify that I am authorized to act on behalf of Offeror in this matter and that Offeror has not discriminated and will not discriminate against any disadvantaged business enterprise, minority-owned business, women-owned business, emerging small business, or business that a service-disabled veteran owns, in obtaining any required subcontracts. Failure to do so shall be grounds for disqualification.

MANAGING RETAINAGE

Pursuant to HB 2415(2019), Oregon Law now provides three options for managing retainage for construction contracts over $500,000 in value. If the total contract price bid exceeds $500,000, please indicate the method your firm prefers for the retainage on this contract:

_____ (a) Deposit a bond, or securities or other instruments with the County or in a bank or trust company, and have no retainage withheld, as described in ORS 279C.560(4);

__X__ (b) Have the County place the retainage as it is earned in an interest-bearing bank account, at no cost to you, and after completion you will receive all of the interest earned along with your retainage, pursuant to ORS 279C.560(5); or

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_____ (c) Have the County place the retainage as it is earned in an interest-bearing escrow account, where you will be responsible for the costs of the escrow, and will receive the interest along with your retainage, with the amount reduced by the fees charged by the escrow agent.

If neither option (a) nor (b) are chosen, the default method required by the law will be that the retainage goes into an escrow account as described in option (c). Offerors should be aware that, under option (c), it is possible that the escrow fees to be deducted could be as much as or greater than the interest earned on the retainage. There is no charge or deduction for option (a) or (b).

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EXHIBIT D: TRB25001CB

OFFEROR SIGNATURE FORM BY OFFEROR'S DULY AUTHORIZED REPRESENTATIVE

THIS BID MUST BE SIGNED IN INK BY AN AUTHORIZED REPRESENTATIVE OF THE OFFEROR; ANY ALTERATIONS OR ERASURES TO THE BID MUST BE INITIALED IN INK BY THE UNDERSIGNED AUTHORIZED REPRESENTATIVE.

The undersigned acknowledges, attests and certifies individually and on behalf of the Offeror that:

(1) He/she is a duly authorized representative of the Offeror, has been authorized by Offeror to make all representations, attestations, and certifications contained in this bid and all Addenda, if any, issued.

(2) Offeror, acting through its authorized representatives, has read and understands all bid instructions, Specifications, Plans, terms and conditions contained in this bid document (including all listed attachments and Addenda, if any, issued).

(3) The bid submitted is in response to the specific language contained in the ITB, and Offeror has made no assumptions based upon either (a) verbal or written statements not contained in the ITB or (b) any previously issued ITB.

(4) The County shall not be liable for any claims or be subject to any defenses asserted by Offeror based upon, resulting from, or related to, Offeror's failure to comprehend all requirements of the ITB.

(5) The County shall not be liable for any expenses incurred by Offeror in preparing and submitting its offer or in participating in the offer evaluation/selection process.

(6) The Offeror agrees to be bound by and comply with all applicable requirements of ORS 279C.800 through ORS 279C.870 and the administrative rules of the Bureau of Labor and Industries (BOLI), or when applicable, the Davis-Bacon Act (40 U.S.C. 3141 to 3148), regarding prevailing wage rates.

(7) No officer, agent, or employee of Yamhill County has a financial interest in this response, and the offer was prepared independently from all other Offerors, and without collusion, fraud, or other dishonesty.

(8) Offeror agrees to be bound by and comply with all requirements, Specifications, Plans, terms and conditions contained in this bid (including all listed attachments and Addenda, if any, issued).

(9) Offeror will furnish the designated item(s) or service(s) in accordance with the Specifications, Plans and requirements, and will comply in all respects with the terms of the resulting contract upon award.

(10) Offeror certifies, to the best of its knowledge and belief that neither it nor any of its principals are presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from submitting bids or proposals by any federal, state or local entity, department or agency.

(11) Offeror certifies that it has not and will not discriminate against a subcontractor in the awarding of a subcontractor because the subcontractor is a minority, women, or emerging small business enterprise certified under ORS 200.055.

(12) Offeror represents and warrants that Offeror has the power and authority to enter into and perform the contract and that the contract, when executed and delivered, shall be a valid and binding obligation of the contractor enforceable in accordance with its terms.

(13) All affirmations and certifications contained in this bid response are true and correct.

Offeror Business Name: Blue Spruce Builders Inc

Federal Employer Identification No.: 203796206

Name and Title of Duly Authorized Representative: Richard Moore

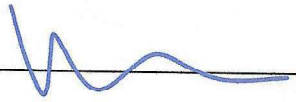
Authorized Signature:  Date: 6/30/2025

Exhibit A Board Order No.: 25-352

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Outlook

Prime Contractor Prequalification Application

From Rich Moore <rich@bluesprucebuilders.com>
Date Mon 6/30/2025 12:59 PM
To odotprocurementofficeconstruction@odot.oregon.gov <odotprocurementofficeconstruction@odot.oregon.gov>

1 attachment (8 MB)
scan_20250630195155.pdf;

We just successfully completed a project for ODOT at Detroit Lake Maintenance Station
See attached application for Prequalification for future projects.

Thanks!

Rich Moore
Blue Spruce Builders Inc
503.930.9888

blue spruce builders

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Lot 2

Received 3:20pm met deadline

FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM

PROJECT NAME: 2025 Yamhill County Transit Operations Center TI Project

BID #: TRB25001CB CLOSING: Date: 6/30/25 Time: 2pm

This form must be submitted at the location specified in the Invitation to Bid on the advertised closing date or within two working hours after the advertised closing time.

List below the name of each subcontractor that will be furnishing labor or will be furnishing labor and materials and that is required to be disclosed, the category of work that subcontractor will be performing and the dollar value of the subcontract. Enter "NONE" if there are no subcontractors that need to be disclosed. (ATTACH ADDITIONAL SHEETS IF NEEDED.)

SUBCONTRACTOR NAME	CATEGORY	DOLLAR OF WORK VALUE
FARNHAM ELECTRIC	ELECTRICAL	$ 10,982.00
CASLIN	DRYWALL	$ 12,500.00
~~PRINTING~~ PRECISION 1	PRINTING	$ 11,800.00
NW ENDEAVORS	FLOORING	$ 26,331.00
KRUSCO	CASEWORK	$ 15,833.00

Failure to submit this form by the disclosure deadline will result in a nonresponsive bid. A nonresponsive bid will not be considered for award.

Form submitted by (Offeror name): Blue Spruce Builders Inc

Contact name: Richard Moore Phone no.: 503 930 9388

EXHIBIT B

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

Liberty Mutual SURETY

Bid Bond

CONTRACTOR:
(Name, legal status and address)

BLUE SPRUCE BUILDERS INC
4600 PERRYDALE RD
DALLAS, OR 97338

SURETY:
(Name, legal status and principal place of business)

The Ohio Casualty Insurance Company
175 Berkeley Street
Boston, MA 02116

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

OWNER:
(Name, legal status and address)

YAMHILL COUNTY, OREGON
535 NE 5TH STREET
MCMINNVILLE, OR 97128

MAILING ADDRESS FOR NOTICES:

Liberty Mutual Surety Claims
P.O. Box 34526
Seattle, WA 98124

BOND AMOUNT: THREE HUNDRED THOUSAND AND NO/CENTS - $300,000.00

PROJECT:
(Name, location or address, and Project number, if any)

2025 YAMHILL COUNTY TRANSIT OPERATIONS CENTER
TENANT IMPROVEMENTS PROJECT
BID# TRB25001CB

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner 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. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 27 day of JUNE, 2025.

(Witness)	*(Contractor as Principal)* *(Seal)*
	PRESIDENT *(Title)*
	The Ohio Casualty Insurance Company *(Surety)*
(Witness)	KIMBERLY STAMM, ATTORNEY IN FACT *(Title)*

THE OHIO CASUALTY INSURANCE COMPANY INCORPORATED 1919 NEW HAMPSHIRE

Init. /

Liberty Mutual Surety vouches that the original text of this document conforms exactly to the text in AIA Document A310–2010 Edition Bid Bond.

Exhibit B Board Order No.: 25-352

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

Liberty Mutual. SURETY

POWER OF ATTORNEY

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: **8214203 - 987885**

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Kimberly Stamm

all of the city of Post Falls state of ID each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 11th day of June, 2025.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
Nathan J. Zangerle, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 11th day of June, 2025 before me personally appeared Nathan J. Zangerle, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2029
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes Nathan J. Zangerle, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this _____ day of _____, _____.

By: _____
Renee C. Llewellyn, Assistant Secretary

LMS-12873 LMIC OCIC WAIC Multi Co 02/24

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

For bond and/or Power of Attorney (POA) verification inquiries, please call 610-832-8240 or email HOSUR@libertymutual.com.

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YCT Transit Operations Center Tenant Improvement IFB
ADDENDUM 1 - Dated: 6/18/2025

This addendum provides clarifications and revisions to the Invitation for Bids (IFB) for the YCT Facility Renovation Project. All bidders must acknowledge receipt of this addendum as outlined at the end of this document.

1. Occupancy During Renovation

Question: Do you expect staff to be working in the building while the renovations are being made?

Response: Originally, YCT anticipated that staff would remain in the building during construction, with work completed in phases. After further evaluation of noise, environmental factors, and associated costs, YCT has decided to relocate all workforce personnel—except for maintenance staff and personnel assigned to the shop area (including the shop office)—for the duration of the renovation.

2. Updated Pricing and Schedule Expectations

The decision to relocate personnel during the renovation will impact on the IFB as follows:

Pricing: Bidders should assume that, aside from maintenance staff and the shop area (including the shop office), the building will be unoccupied by YCT personnel throughout the renovation.

Schedule: The original IFB allowed an 11-month construction window from August 1, 2025, to June 30, 2026. YCT now requests that bidders assume **a consecutive three-month construction** window for **completing the base scope of work.** (This is to minimize the need for staff to be out of the building.) This consecutive three-month period may occur at any time within the 11-month window, provided that all work is completed by June 30, 2026. As the bidder includes alternates in their proposal, they must clearly state whether selection of those alternates would extend the three-month base construction period.

Please note: The final work schedule and timeline will be developed collaboratively between the selected contractor and YCT and will be incorporated into the executed contract.

3. Clarification of Scope and Permitting Responsibilities

Question 1: Have the building and other permits already been pulled?
Response: YCT has already secured the general building permit. However, contractors (or their subcontractors) are responsible for obtaining any required trade-specific permits, including but

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not limited to electrical and plumbing. Bidders should verify all applicable permit requirements based on their proposed scope of work.

Question 2: Can a contractor request changes to the draft contract language in Exhibit E?
Response: Yes, any requested changes to the draft contract language should be submitted with the bid. YCT will consider these changes in drafting the final contract language.

Question 3: During the job walk through it was stated there would be no exterior scope however, 1/A2.1 shows a new fenced storage area on the southeast corner of the building. Are we to exclude that
Response: Yes, please exclude this area from your bid. The fenced storage area on 1/A2.1 was inadvertently left in the final drawings.

Question 4: Spec calls for 3/4" thick counter tops but "DuPontTM Corian® Solid Surface" comes in 1/2" thickness only. Are we supposed to use required substrate to make up the difference in thickness?
Response: Specification Section 064100-2.02 incorrectly noted ¾" Corian thickness. Corian should be standard ½" thick. Follow the manufacturer's installation instructions for required substrate.

4. Acknowledgment of Addendum

All bidders must acknowledge receipt of this addendum by signing the addendum acknowledgement on the following page and submitting it with the bid package. Failure to do so may result in the bid being deemed non-responsive.

5. Outstanding Questions

By Friday afternoon (June 20, 2026) we will also have another formal Addendum response to the questions below and updates to the plans or specifications will be made as appropriate. Please note, any additional questions received by June 20th will be responded to as promptly as possible, but no later than June 27th.

Question: In Alternate 1, will any demolition be required to the ceiling to address HVAC, electrical, and plumbing?

Question: Does the waterline in the room with the electrical panels need to be relocated?

Question: There is no lighting schedule for fixture types C, C1 and D

Question: There is no type listed for the shop lights.

Question: Lighting Substitution Request

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YCT Transit Operations Center Tenant Improvement IFB
Acknowledgment Page for Addendum #1: Dated 6/18/2025

I acknowledge receipt and understanding of Addendum 1.

Signature: _____

Printed Name: Richard Moore

Company: Blue Spruce Builders Inc

Date: 6/30/2025

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YCT Transit Operations Center Tenant Improvement IFB
ADDENDUM 2 - Dated: 6//20/2025

This addendum provides clarifications and revisions to the Invitation for Bids (IFB) for the YCT Transit Operations Center Tenant Improvement IFB. All bidders must acknowledge receipt of this addendum as outlined at the end of this document.

1. Further Clarification of Scope Elements

Question 1: In Alternate 1, will any demolition be required to the ceiling to address HVAC, electrical, and plumbing?
Response: The M2.01 sheet has been updated and is attached. Limited demolition will be required for ceiling diffusers in new office locations.

Question 2: Does the waterline in the room with the electrical panels need to be relocated?
Response: YCT places a high priority on safety. Contractors are expected to use their professional judgment in determining whether the existing waterline in the Electrical room (showing on plan P2.1) presents a safety risk in proximity to the new electrical work required. If the contractor determines that relocation is necessary to meet safety standards or code requirements, that work should be included in the bid and noted accordingly.

Question 3: There is no lighting schedule for fixture types C, C1 and D
Response: The lighting schedule for fixture types C, C1 and D has been updated and attached as part of this addendum in a revised Drawing E2.1

Question 4: There is no type listed for the shop lights.
Response: There is no upgrade to the shop lights. The existing lights will remain.

Question 5: What is the spec for new 2x4 fixtures in the new hallway next to the new breakroom 107?
Response: See Drawing E2.1 Add 2 showing the lighting fixture B1/B1E:

Question 6: Is the new panel "D" part of base, alternate 2, or alternate 3?
Response: See Sheet E3.1 Add 2 – It is part of the Base bid.

Question 7: Are the alternate 3 lighting controls design-build?
Response: Yes, Alternate 3 Lighting Controls are Design-Build. See Section 26 00 00 – Electrical Basic Requirements, paragraph 1.01 – *Design-Build Summary, A. Work included in 26 00 00 applies to Division 26, Electrical work to provide materials, labor, tools, permits and incidentals to make electrical systems ready for Owner's use for proposed project.*

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2. Acknowledgment of Addendum 2

All bidders must acknowledge receipt of this addendum by signing the addendum acknowledgement below and submitting it with the bid package. Failure to do so may result in the bid being deemed non-responsive.

3. Outstanding Questions

No later than Tuesday, June 24, 2026, we will have another Addendum (Addendum 3) to address the request to substitute lighting.

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YCT Transit Operations Center Tenant Improvement IFB

Acknowledgment Page for Addendum #2: Dated 6/20/2025

I acknowledge receipt and understanding of Addendum 2 and have seen the separate attachments - updates to Drawing E2.1 (Addendum 2); E3.1 (Addendum 2); M2.1 (Addendum) and P2.1 (Addendum) - that are referenced herein.

Signature: _____

Printed Name: Richard Moore

Company: Blue Spruce Builders Inc

Date: 6/20/2025

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

YCT Transit Operations Center Tenant Improvement IFB
ADDENDUM 3 - Dated: 6//23/2025

This addendum provides clarifications and revisions to the Invitation for Bids (IFB) for the YCT Transit Operations Center Tenant Improvement IFB. All bidders must acknowledge receipt of this addendum as outlined at the end of this document.

1. Further Clarification of Scope Elements

Question 1: Lighting Substitution Request
Response: The proposed substitutions were approved and added to the Luminaire Schedule which was revised and clouded on Drawing E2.1 and issued with Addendum No. 2 on Friday.

Clarification to Alternate 1: See attached Section 23 09 33 – Electric and Electronic Control System for HVAC

2. Asbestos Survey Finalized

The asbestos survey was completed today. The survey found no asbestos on site; work can start per the existing schedule in the IFB.

3. Acknowledgment of Addendum 3

All bidders must acknowledge receipt of this addendum by signing the addendum acknowledgement below and submitting it with the bid package. Failure to do so may result in the bid being deemed non-responsive.

Exhibit B Board Order No.: 25-352

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YCT Transit Operations Center Tenant Improvement IFB

Acknowledgment Page for Addendum #3: Dated 6/23/2025

I acknowledge receipt and understanding of Addendum 3 and have seen the separate attachment – Section 23 09 33 Electric and Electronic Control System for HVAC - that is referenced herein.

Signature: _____

Printed Name: Richard Moore

Company: Blue Spruce Builders Inc

Date: 6/30/25

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

YCT Transit Operations Center Tenant Improvement IFB
ADDENDUM 4 - Dated: 6//27/2025

This addendum provides clarifications and revisions to the Invitation for Bids (IFB) for the YCT Transit Operations Center Tenant Improvement IFB. All bidders must acknowledge receipt of this addendum as outlined at the end of this document.

Approval of Lighting Substitution Request for Type "D"

PLEASE NOTE - On Sheet E2.1, Luminaire Schedule, we are revising Type D, MFG / Catalog # to read as follows: "***LITHONIA STL4 SERIES, COLUMBIA LIGHTING RLW SERIES, OR APPROVED EQUAL***".

3. Acknowledgment of Addendum 4

All bidders must acknowledge receipt of this addendum by signing the addendum acknowledgement below and submitting it with the bid package. Failure to do so may result in the bid being deemed non-responsive.

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YCT Transit Operations Center Tenant Improvement IFB

Acknowledgment Page for Addendum #4: Dated 6/27/2025

I acknowledge receipt and understanding of Addendum 3 and have seen the separate attachment – Section 23 09 33 Electric and Electronic Control System for HVAC - that is referenced herein.

Signature: _____

Printed Name: Richard Moore

Company: Blue Spruce Builders Inc

Date: 6/30/2025

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

YAMHILL COUNTY TRANSIT

OPERATIONS CENTER - TENANT IMPROVEMENTS

11160 SW DURHAM LANE

MCMINNVILLE, OREGON 97128

ISSUED FOR BID

PROJECT SPECIFICATIONS

MAY 30, 2025

waterleaf
1101 SW Washington Street
Portland, Oregon 97205
Phone: 503/228-7571
waterleaf.com

architecture, interiors & planning

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SECTION 00 01 10

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SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.01 PROJECT

A. Project Name: Yamhill County Transit – Operations Center Tenant Improvements.

B. Project Location: 11160 SW Durham Lane, McMinnville, Oregon, 97128

C. Property Owner: CH Holdings LLC, 7000 Amity Road, Amity OR 97101

D. Tenant: Yamhill County.

E. Architect: Waterleaf Architecture, Portland, Oregon

F. The project consists of tenant improvements to support Yamhill County Transit's administration, operations, and maintenance functions, within their 9,600 square foot lease facility building. The work includes minor modifications to existing partition walls, new walls and doors, new casework and sink at breakroom, removal of existing tile and carpet flooring, new flooring as indicated, painting of walls and ceilings as indicated, and other miscellaneous interior finishes. In addition, refer to Section 01 23 00 – Alternates, for a description of Additive Alternates.

1.02 OWNER OCCUPANCY

A. Owner intends to continue to occupy and maintain ongoing operations in the building during the entire construction period.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner operations.

1.03 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: As directed by Yamhill County Transit.

B. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Time Restrictions:

1. Work limited to Yamhill County Transit work hours unless requested and submitted for written authorization.

D. Utility Outages and Shutdown:

1. Prevent accidental disruption of utility services to other facilities.

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1.04 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

A. Prepare the schedule of values in such a manner that each major item of work and each subcontracted item of work is shown as a line item broken down in terms of material and labor costs.

B. Form to be used: AIA Document G703, Application and Certificate for Payment Continuation Sheet or similar format.

C. Forms filled out by hand will not be accepted.

D. Submit schedule of values for review by the Owner and Architect prior to the first application for payment.

E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Form to be used: AIA Document G702, supported by AIA Document G703, Continuation Sheet.

C. Forms filled out by hand will not be accepted.

D. Execute certification by signature of authorized officer.

E. Submit three copies of each Application for Payment.

F. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.04 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

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1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.

2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation.

D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

E. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

F. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

1.05 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:

1. All closeout procedures specified in Section 01 70 00 – Execution and Closeout Requirements.

2. All closeout submittals specified in Section 01 78 00 – Closeout Submittals.

END OF SECTION

Exhibit B Board Order No.: 25-352

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SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for alternates.

B. Schedule of Alternates (refer to schedule at the end of this section).

1.02 RELATED REQUIREMENTS

A. Alternates are additive and will each require a price that is separate from the base bid on the pricing submittal form (Exhibit A of the Bid Document).

B. Issued for Bid Drawings are included as (Exhibit G of the Bid Document).

C. Issued for Bid Specifications are included as (Exhibit H of the Bid Document).

D. A Pre-Bid Conference (see Invitation to Bid, Section B) will include a specific overview of the scope of work for each Alternate.

1.03 GENERAL

A. A price for each Alternate shall be entered in the Bid Form in the spaces provided for Bid Alternates.

B. The Bidder shall be responsible for determining from the Bid and Contract Documents the full scope of the proposed Bid Alternates briefly described below including the stipulated elements and any and all required associated work.

C. Coordination: Coordinate related work and modify or adjust adjacent work as necessary to ensure that the Work performed by each accepted Alternate is complete and fully integrated into the Project.

D. The Bidder shall quote all-inclusive added costs for proposed Bid Alternates listed on the Bid Form. The Bidder shall provide a quote for all proposed Bid Alternates. Quoted Bid Alternates shall include the costs for all work, including Contractor's direct and indirect costs and fees, proposed to be added or deleted from the scope of the Project and all work, including all costs and fees, required to fully execute the proposed Project scope.

E. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

1.04 SCHEDULE OF ALTERNATES

A. Additive Alternate #1: Extension of existing partial height walls to ceiling and associated HVAC modifications.

B. Additive Alternate #2: New restroom in Shop (Restroom – 124) and associated plumbing.

C. Additive Alternate #3: Lighting upgrades.

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PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Progress meetings.

C. Construction progress schedule.

D. Submittals for review, information, and project closeout.

E. Number of copies of submittals.

F. Submittal procedures.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Contractor to arrange and conduct a preconstruction meeting prior to initialization of work.

B. Attendance Required:

1. Owner Representative.
2. Architect.
3. Contractor.
4. Major Subcontractor(s).

C. Agenda:

1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract.

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6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.

7. Scheduling.

8. Use of premises by Owner and Contractor.

9. Owner's requirements and occupancy prior to completion.

10. Construction facilities and controls provided by Owner.

11. Temporary utilities provided by Owner.

12. Survey and building layout.

13. Security and housekeeping procedures.

14. Application for payment procedures.

15. Procedures for testing and inspections.

D. Record minutes and distribute copies within 7 days after meeting to participants.

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work.

B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

C. Agenda:

1. Review minutes of previous meetings.

2. Review of Work progress.

3. Field observations, problems, and decisions.

4. Identification of problems that impede, or will impede, planned progress.

5. Review of submittals schedule and status of submittals.

6. Maintenance of progress schedule.

7. Corrective measures to regain projected schedules.

8. Planned progress during succeeding work period.

9. Maintenance of quality and work standards.

10. Effect of proposed changes on progress schedule and coordination.

11. Other business relating to Work.

D. Record minutes and distribute copies within 7 days after meeting to participants.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 20 days submit draft of proposed complete schedule for review.

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1. Include written certification that major contractors have reviewed and accepted proposed schedule.

B. Within 10 days after joint review, submit complete schedule.

C. Submit updated schedule with each Application for Payment.

3.04 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:

1. Product data.

2. Shop drawings.

3. Samples for selection.

4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - CLOSEOUT SUBMITTALS.

3.05 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:

1. Design data.

2. Certificates.

3. Test reports.

4. Inspection reports.

5. Manufacturer's instructions.

6. Manufacturer's field reports.

7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:

1. Project record documents.

2. Operation and maintenance data.

3. Warranties.

4. Bonds.

5. Other types as indicated.

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B. Submit for Owner's benefit during and after project completion.

3.07 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review: Submit 1 electronic copy in PDF format; an electronically marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.

3.08 SUBMITTAL PROCEDURES

A. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

D. Schedule submittals to expedite the Project, and coordinate submission of related items.

E. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

F. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

G. Provide space for Contractor and Architect review stamps.

H. When revised for resubmission, identify all changes made since previous submission.

I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

J. Submittals not requested will not be recognized or processed.

END OF SECTION

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SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Mock-ups.

B. Control of installation.

C. Tolerances.

D. Testing and inspection services.

E. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 01 42 16 - Definitions.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Testing Agency Qualifications:

1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.

1. Include:

a. Date issued.

b. Project title and number.

c. Name of inspector.

d. Date and time of sampling or inspection.

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e. Identification of product and specifications section.

f. Location in the Project.

g. Type of test/inspection.

h. Date of test/inspection.

i. Results of test/inspection.

j. Conformance with Contract Documents.

k. When requested by Architect, provide interpretation of results.

2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.

1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.05 TESTING AND INSPECTION AGENCIES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

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E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.

2. Perform specified sampling and testing of products in accordance with specified standards.

3. Ascertain compliance of materials and mixes with requirements of Contract Documents.

4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.

5. Perform additional tests and inspections required by Architect.

6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Agency may not approve or accept any portion of the Work.

3. Agency may not assume any duties of Contractor.

4. Agency has no authority to stop the Work.

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C. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.

2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.

3. Provide incidental labor and facilities:

a. To provide access to Work to be tested/inspected.

b. To obtain and handle samples at the site or at source of Products to be tested/inspected.

c. To facilitate tests/inspections.

d. To provide storage and curing of test samples.

4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.

5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

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SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary barriers.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Field offices.

1.02 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities is permitted.

C. Maintain daily in clean and sanitary condition.

D. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

A. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

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1.07 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.08 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.09 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.10 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01 57 21

INDOOR AIR QUALITY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction.

C. Testing indoor air quality after completion of construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.

1. Cleaning of ductwork is not contemplated under this Contract.

2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.

1. Furnish products meeting the specifications.

2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures.

B. Section 01 40 00 - Quality Requirements: Testing and inspection services.

C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.04 REFERENCE STANDARDS

A. SMACNA IAQ Guideline for Occupied Buildings Under Construction; 2nd Edition ANSI/SMACNA 008-2208.

1.05 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

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1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA IAQ Guidelines for Occupied Buildings Under Construction as a guide.

1. Submit not less than 60 days before enclosure of building.

2. Identify potential sources of odor and dust.

3. Identify construction activities likely to produce odor or dust.

4. Identify areas of project potentially affected, especially occupied areas.

5. Evaluate potential problems by severity and describe methods of control.

6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.

7. Describe cleaning and dust control procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Air Contaminant Test Plan: Identify:

1. Testing agency qualifications.

2. Locations and scheduling of air sampling.

3. Test procedures, in detail.

4. Test instruments and apparatus.

5. Sampling methods.

F. Air Contaminant Test Reports: Show:

1. Location where each sample was taken, and time.

2. Test values for each air sample; average the values of each set of 3.

3. HVAC operating conditions.

4. Certification of test equipment calibration.

5. Other conditions or discrepancies that might have influenced results.

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PART 2 - PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

PART 3 - EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:

1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.

2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.

3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. HVAC equipment and ductwork may NOT be used for ventilation during construction:

1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.

2. Exhaust directly to outside.

3. Seal HVAC air inlets and outlets immediately after duct installation.

D. Do not store construction materials or waste in mechanical or electrical rooms.

E. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

1. Inspect duct intakes, return air grilles, and terminal units for dust.

2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.

3. Clean tops of doors and frames.

4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.

5. Clean return plenums of air handling units.

6. Remove intake filters last, after cleaning is complete.

F. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

G. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

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3.02 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Do not start flush-out until:

1. All construction is complete.

2. HVAC systems have been tested, adjusted, and balanced for proper operation.

3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.

4. New HVAC filtration media have been installed.

C. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.

1. Obtain Owner's concurrence that construction is complete enough before beginning flush-out.

2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.

3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.

4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:

a. Begin ventilation at least three hours prior to daily occupancy.

b. Continue ventilation during all occupied periods.

c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.

D. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Do not start air contaminant testing until:

1. All construction is complete, including interior finishes.

2. HVAC systems have been tested, adjusted, and balanced for proper operation.

3. New HVAC filtration media have been installed.

C. Indoor Air Samples: Collect from spaces representative of occupied areas:

1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.

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2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet; take samples from areas having the least ventilation and those having the greatest presumed source strength.

3. Collect samples from height from 36 inches to 72 inches above floor.

4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.

5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.

6. When retesting the same building areas, take samples from at least the same locations as in first test.

D. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

E. Analyze air samples and submit report.

F. Air Contaminant Concentration Determination and Limits:

1. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.

2. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.

3. Formaldehyde: Not more than 50 parts per billion.

4. Formaldehyde: Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.

5. Total Volatile Organic Compounds (TVOC): Not more than 500 micrograms per cubic meter.

6. Total Volatile Organic Compounds (TVOC): Measure in micrograms per cubic meter, in relation to outside air; not more than 200 micrograms per cubic meter higher than outside air.

7. Particulates (PM10): Not more than 50 micrograms per cubic meter.

8. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.

END OF SECTION

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SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations and procedures.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Lists of products to be removed from existing building.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures.

C. Section 01 40 00 - Quality Requirements: Product quality monitoring.

D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

1.03 REFERENCE STANDARDS

A. 16 CFR 260 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; current edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

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PART 2 - PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Do not use products having any of the following characteristics:

1. Made outside the United States, its territories, Canada, or Mexico.

2. Made using or containing CFC's or HCFC's.

3. Made of wood from newly cut old growth timber.

C. Where all other criteria are met, Contractor shall give preference to products that:

1. Are extracted, harvested, and/or manufactured closer to the location of the project.

2. Have longer documented life span under normal use.

3. Result in less construction waste.

D. Regionally-Sourced Products:

1. Overall Project Requirement: Provide materials amounting to a minimum of 10 percent of the total value of all materials (excluding plumbing, HVAC, electrical, elevators, and other equipment) that have been extracted, harvested, or recovered, as well as manufactured, within a radius of 500 miles from the project site.

2. Specific Product Categories: Provide regionally-sourced products as specified elsewhere.

E. Products with Rapidly Renewable Material Content:

1. Definition: Materials made from plants that are typically harvested within 10 years or less after planting.

2. Specific Product Categories: Provide renewable material content as specified elsewhere.

F. Products with Recycled Content:

1. Specific Product Categories: Provide recycled content as specified elsewhere.

2. Calculations: Where information about recycled content is required to be submitted:

a. Determine percentage of post-consumer and post-industrial content separately, using the guidelines contained in 16 CFR 260.7(e).

b. Previously used, reused, refurbished, and salvaged products are not considered recycled.

c. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.

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d. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of all material in the item.

e. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.

f. Sustainably Harvested Wood:

3. Definition: Wood-based materials include but are not limited to structural framing, dimension lumber, flooring, wood doors, finishes, and furnishings that are permanently installed in the project. Wood and wood-based products not permanently installed in the project are not included in the definition.

4. Specific Wood-Based Fabrications: Fabricate of sustainably harvested wood when so specified elsewhere.

5. Certification: Provide wood certified or labeled by an organization accredited by one of the following:

a. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit http://www.fsccanada.org, for the USA visit http://www.fscus.org.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 - EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. During the bidding period requests for substitution must be received no later than 10 calendar days prior to the Bid Opening.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the substitution as for the specified product.

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3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.

5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Substitution Submittal Procedure:

1. Requests for substitution must be submitted using the CSI Substitution Request Form included at the end of this section.

2. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.

3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

4. The Architect will notify Contractor in writing of decision to accept or reject request.

F. Substitutions will normally not be considered after the Bid Opening date except when required due to unforseen circumstances. Within 30 days after date of Contract, the Owner may consider formal written requests for substitution of products in place of those specified when submitted in accordance with the requirements stipulated herein. To receive consideration, one or more of the following conditions must be documented in the request:

1. The substitution is required for compliance with final interpretation of Code requirements.

2. The substitution is required due to unavailability of a specified product, through no fault of the Contractor.

3. The substitution is required because subsequent information disclosed the inability of the specified product to perfrom properly or to fit in the designated space.

4. The substitution is required because it has become clearly evident, in the judgement of the Owner, that a substitute would be substantially in the best interest of the Owner in terms of cost, quality and schedule.

3.02 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

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D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Prevent contact with material that may cause corrosion, discoloration, or staining.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

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SECTION 01 61 16

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. Requirement for installer certification that they did not use any non-compliant products.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures.

1.03 DEFINITIONS

A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:

1. Adhesives, sealants, and sealer coatings.

2. Paints and coatings.

3. Resilient Flooring, Carpet Tile, and Adhesive.

4. Cabinet work and adhesives.

B. Interior of Building: Anywhere inside the exterior weather barrier.

C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; current edition.

B. CAL (VOC) - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers (including Addendum 2004-01); State of California Department of Health Services.

C. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; Carpet and Rug Institute.

D. GreenSeal GS-36 – Standard for Adhesives for Commercial Use; Green Seal, Inc.; 2025, Edition 2.2.

E. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition; www.aqmd.gov.

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F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.

C. Installer Certifications for Accessory Materials: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Adhesives and Joint Sealants: Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168.

1. Evidence of Compliance: Report of laboratory testing performed in accordance with requirements.

B. Aerosol Adhesives: Provide only products having volatile organic compound (VOC) content not greater than required by GreenSeal GS-36.

1. Evidence of Compliance: A current GreenSeal Certification.

C. Paints and Coatings: Provide products having VOC content not greater than that required by South Coast Air Quality Management District Rule No. 1113.

1. Provide coatings that comply with the most stringent requirements specified in 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

3. Evidence of Compliance: Report of laboratory testing performed in accordance with requirements.

D. Resilient Flooring, Carpet Tile, and Adhesive: Provide products having VOC content not greater than that required for CRI Green Label Plus certification.

1. Evidence of Compliance: Acceptable types of evidence are:

a. Current Green Label Plus Certification.

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b. Report of laboratory testing performed in accordance with requirements.

E. Other Product Categories: Comply with limitations specified elsewhere.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. All additional costs to restore indoor air quality due to installation of non-compliant products will be borne by the Contractor.

END OF SECTION

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SECTION 01 60 00

EPECRTION AND CUOSEORT QEMRIQE- ENTS

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1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Cleaning and protection.

E. Starting of systems and equipment.

F. Demonstration and instruction of Owner personnel.

G. Closeout procedures, except payment procedures.

H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures.

C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

D. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

E. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:

1. Structural integrity of any element of Project.

2. Integrity of weather exposed or moisture resistant element.

3. Efficiency, maintenance, or safety of any operational element.

4. Visual qualities of sight exposed elements.

5. Work of Owner or separate Contractor.

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1.04 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing in the building.

C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

D. Pollution Control: Provide methods, means, and facilities to prevent discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.05 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

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2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

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3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of examination, preparation and installation procedures.

2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

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C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

1. Complete the work.

2. Fit products together to integrate with other work.

3. Provide openings for penetration of mechanical, electrical, and other services.

4. Match work that has been cut to adjacent work.

5. Repair areas adjacent to cuts to required condition.

6. Repair new work damaged by subsequent work.

7. Remove samples of installed work for testing when requested.

8. Remove and replace defective and non-conforming work.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

I. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

2. Match color, texture, and appearance.

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3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.08 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

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3.09 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.10 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Clean filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Notify Architect when work is considered ready for Substantial Completion.

C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

E. Notify Architect when work is considered finally complete.

F. Complete items of work determined by Architect's final inspection.

3.13 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

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C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

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SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

F. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.

2. Burying on the project site.

3. Dumping or burying on other property, public or private.

4. Other illegal dumping or burying.

G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

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B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Waste Management Plan: Contractor shall develop and submit a Constrcution Waste Management Plan, prior to the start of any demolition or construction. e the following information:

1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.

2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).

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3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.

4. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.

5. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

C. Waste Disposal Reports: Submit monthly reports, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.

2. Submit Report on a form acceptable to Owner.

3. Landfill Disposal: Include the following information:

a. Identification of material.

b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.

c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

4. Incinerator Disposal: Include the following information:

a. Identification of material.

b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.

c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

5. Recycled and Salvaged Materials: Include the following information for each:

a. Identification of material, including those retrieved by installer for use on other projects.

b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.

c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.

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d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:

a. Identification of material and how it was used in the project.

b. Amount, in tons or cubic yards.

c. Include weight tickets as evidence of quantity.

7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Pre-bid meeting.

2. Pre-construction meeting.

3. Regular job-site meetings.

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E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. Provide containers as required.

2. Provide adequate space for pick-up and delivery and convenience to subcontractors.

3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

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SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Individual Product Sections: Specific requirements for operation and maintenance data.

B. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Submit documents within 10 days after Date of Substantial Completion, and prior to final Application for Payment.

C. Operation and Maintenance Data:

1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.

2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.

3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.

4. Submit two sets of revised final documents in final form within 10 days after final inspection.

D. Warranties and Bonds:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.

2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

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PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Addenda.
3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings: Legibly mark each item to record actual construction including:

1. Field changes of dimension and detail.
2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

B. Prepare data in the form of an instructional manual.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 3 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

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F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

   a. Significant design criteria.

   b. List of equipment.

   c. Parts list for each component.

3. Part 3: Project documents and certificates, including the following:

   a. Shop drawings and product data.

3.04 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

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SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Demolition and removal of selected portions of the building.

B. Extent of selective demolition work is indicated on the Drawings.

C. Repair of damaged surfaces.

1.02 RELATED WORK

A. Section 01 70 00 – Execution and Closeout Requirements: Cutting and Patching

B. Section 01 74 19 – Construction Waste Management and Disposal

1.03 REFERENCE STANDARDS

A. American National Standards Institute; ANSI A10.6 - American National Standard Safety Requirements for Demolition.

1.04 EXISTING CONDITIONS

A. Before commencement of demolition work, determine location of existing utilities to remain and protect such utilities during demolition and construction. Contractor shall secure, schedule and pay for all utility location services.

B. Cost of repair of damage to utilities or existing construction occurring through negligence or carelessness of Contractor shall be borne by Contractor.

C. Cost of security of new construction in areas affected by this contract shall be borne by Contractor.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to the A/E for review prior to commencement of work. Include start and end dates for each activity. Ensure Owner's on-site operations are uninterrupted. Schedule shall include the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure the Owner’s on-site operations are uninterrupted.

2. Locations of proposed dust and noise control temporary partitions and means of egress.

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3. Coordination of the Owner's continuing occupancy of portions of existing building.

4. Means of protection for items to remain and items in path of waste removal from building

1.06 QUALITY ASSURANCE

A. In addition to complying with all pertinent codes, the Contractor will also comply with the requirements of those insurance carriers providing coverage for the existing building and this work.

B. Regulatory Requirements: Comply with governing EPA° notification regulations before starting selective demolition. Comply with hauling disposal regulations of authorities having jurisdiction.

C. Safety: Comply with the following:

1. Associated General Contractors of America, Inc., "Manual of Accident Prevention in Construction", Workmen's Compensation Board "Safety Code for Construction Work".

2. Oregon State Employment Act Safety Requirements.

3. Occupational Safety and Health ACT (OSHA) requirements.

D. Contractor shall provide methods to ensure pollution control during the demolition period.

E. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in the General Conditions. Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.07 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Condition of Structures: The Owner assumes no responsibility for actual condition of items or structures to be demolished.

1. Notify the A/E of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Under no circumstances will any persons connected with this Project use any adjacent property outside the property limits for the purpose of storing or selling demolition materials.

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D. Protections: Provide temporary barricades and other forms of protection as required to protect Owner personnel and the general public from injury due to selective demolition work.

1. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.

2. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

3. Protect floors with suitable coverings when necessary. Use rubber-tired vehicles for conveying materials in building.

4. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.

5. Temporary Fire Protection: There shall be one fire extinguisher for Class A fires, 2-1/2 gallon size, within 20 feet of any demolition work. All combustible waste removed continuously. No smoking allowed. No device above 180 degrees F. allowed.

6. Remove protections at completion of work. E. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to the Owner.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to the Owner.

1.08 UTILITY SERVICES

A. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

B. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution. Any water damage to portions of building to remain shall be repaired to original condition at no cost to the Owner.

C. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the A/E. Provide temporary services during interruptions to existing utilities, as acceptable to the Owner.

1.09 HAZARDOUS MATERIALS

A. Hazardous materials may be encountered in the Work including the following scopes of work:

1. Plumbing Piping. Piping insulation above finished ceilings may contain hazardous material.

2. Resilient Flooring Demolition: Resilient flooring mastic material may contain hazardous material.

B. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the Owner's Representative.

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PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING WORK

A. New materials: As specified in individual Sections.

B. Match existing products and work for patching work. Matched work shall be consistent with existing work in finish, texture, sheen, craftsmanship, and color.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with the Owner's Representative prior to starting work.

B. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner's Representative.

3.02 PREPARATION

A. Prevent movement or settlement of adjacent materials. Provide shoring and bracing as required.

B. Demolish areas in an orderly and careful manner to detect concealed utilities. Open cavity walls from one side prior to sawcutting and visually inspect for electrical, water, HVAC control, low voltage, and other utility lines. Prior to concrete sawcutting, utility locators shall be retained by the Contractor to mark lines to prevent damage and interruption. If encountered make note of area and contact Owner for review.

C. Provide temporary barricades as necessary to control traffic around construction area and as necessary to ensure the safety of staff, visitors and construction personnel as a result of construction activities.

D. All temporary construction shall conform to the requirements of the County jurisdictions, the State of Oregon, and the Occupational Safety and Health Administration.

E. Protect existing items which are not indicated to be altered.

F. Disconnect, remove, and cap designated utility services within demolition areas.

G. Reroute existing utilities as necessary to maintain service for building. See applicable mechanical and electrical sections.

H. Carpet Protection: At all carpeted areas as determined by the Owner within the area of work, including traffic routes to work area, existing carpet shall be protected by the use of a self-adhesive plastic carpet protection mask similar to "Carpet Mask" by Poly-Tak Protection Systems, Inc. (800- 899-0871), "Carpet Cover" by Americover Inc. (800-747-6095), or approved substitution.

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3.03 DEMOLITION

A. Demolish in orderly and careful manner. Protect existing supporting members and all existing items to remain. Do all demolition necessary to complete the work. Furnish all labor and materials necessary to cut, alter, remove or temporarily remove and replace, existing construction where indicated or as necessary for the completion of the project.

B. Demolition work shall include all work as required for the completion of the project.

C. Verify areas requiring partial demolition do not contain or have utilities crossing through them, including piping, electrical conduit, communications wiring, mechanical controls (pneumatic lines) etc., prior to cutting. Contractor shall schedule and pay for all utility locating services.

D. Remove existing asphalt and concrete paving and base aggregate if required to correct work. Neatly sawcut between the paving to be removed and the adjacent paving to remain at existing nearest control or expansion joints.

E. Where it is necessary to cut into or remove existing materials shown to remain, the Contractor shall patch all surfaces to match the existing surface material as hereinafter called for.

F. Do not burn or bury any materials on the site.

G. Stockpiling of debris is not permitted. Remove demolished materials from the site as the work progresses and dispose of at sites arranged for and paid for (if necessary) by the Contractor. Upon completion of demolition work, leave areas of work in clean condition.

H. Remove and promptly dispose of any contaminated or vermin infested materials encountered.

3.04 RECYCLING DEMOLISHED MATERIALS

A. Separate recyclable demolished materials from other demolished materials to the maximum extent possible. Separate recyclable materials by type.

1. Stockpile materials to be reused away from demolition area. Store components off the ground and protect from the weather.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA°-approved landfill.

B. Remove debris, rubbish and other materials resulting from demolition operations from building site as soon as possible. Storage of this material will not be permitted on the site. Transport and legally dispose of materials off site, without spillage on public streets.

1. Do not allow demolished materials to accumulate on-site. Do not burn demolished materials.

2. Vehicles: To prevent littering of streets, cover open vehicles carrying debris from the building site.

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3. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

3.06 CLEAN-UP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

B. B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

C. C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new construction as indicated on the Drawings.

D. D. Refer to Division 01 Sections for Cutting and Patching, Temporary Facilities and Controls and Cleaning and Waste Management, for additional requirements.

END OF SECTION

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SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Non-structural dimension lumber framing.

B. Communications and electrical room mounting boards.

C. Concealed wood blocking, nailers and supports.

1.02 REFERENCE STANDARDS

A. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; American Forest and Paper Association; 2001.

B. ASTM D 2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2009.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2010.

E. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2005.

F. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; West Coast Lumber Inspection Bureau; 2004, and supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this Section with minimum 5 years' documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

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B. Protect material from discoloration due to uneven exposure to light.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. Species: Douglas Fir-Larch, unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED MATERIALS

A. Grading Agency: West Coast Lumber Inspection Bureau (WCLIB).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):

1. Grade: No. 2.

E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E 84.

2.04 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.05 FABRICATION

A. Shop assemble work for delivery to site, allowing passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 - EXECUTION

3.01 FRAMING INSTALLATION

A. Set framing members level, plumb, and true to line. Discard pieces with defects that would lower required strength.

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B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain framing in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install framing members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but -not less than required by applicable codes and AFPA Wood Frame Construction Manual.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

D. Specifically, provide the following non-structural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
2. Install adjacent boards without gaps.

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3.04 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.05 CLEANING

A. Do not leave any wood, shavings, sawdust, etc. on the floor.

END OF SECTION

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SECTION 06 10 00

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HAGT Y - L ENEGA2

1.01 SECTION INCLUDES

A. Interior finish carpentry items.

B. Wood door and window casings.

1.02 REFERENCE STANDARDS

A. This Section incorporates by reference the latest revisions of the following documents.

1. APA: The Engineered Wood Association
2. ASTM A641: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
4. AWI/AWMAC/WI - Architectural Woodwork Standards (AWS)

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data:

1. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Provide the information required by the AWS.

D. Samples: Submit two samples of wood trim 12 inch long.

E. Qualifications: Submit written documentation of Fabricator's Qualifications.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this Section with minimum 5 years' documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

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B. Protect material from discoloration due to uneven exposure to light.

HAGT 1 - HGOD3 CTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by the AWS for Custom Grade.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.02 LUMBER MATERIALS

A. Door and Window Casings, Standing and Running Trim: Douglas Fir, clear vertical grain, prepare for clear finish.

1. Finish: Field finish with PS-1 as indicated in Section 09 90 00 - Painting.

2.03 FASTENINGS

A. Fasteners: Of size and type to suit application.

B. Fasteners at metal framing: Recessed head type with ribbed or threaded body. The maximum size of the hole in the trim not to exceed 3/16 inch.

2.04 ACCESSORIES

A. Wood Filler: Solvent base, meeting project VOC requirements, tinted to match surface finish color.

2.05 FABRICATION

A. Shop assemble work for delivery to site, allowing passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

HAGT X - EFEC3 TION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting Work of this Section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with the AWS requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Miter corners.

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E. Use concealed fasteners wherever possible, unless noted otherwise on Contract Drawings.

F. At fasteners installed through the exposed surface(s) of the trim, countersink and/or set fasteners low enough to accommodate wood plugs or wood filler.

G. Ease sharp external corners prior to finishing.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations less than 1/4 inch in diameter, and wood plugs in indentations 1/4 inch or greater. Sand work smooth.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OR SECTION

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SECTION 06 41 00

ARCHITECTURAL WOOD CASEWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Cabinet hardware.

C. Countertops and backsplashes

D. Preparation for installing utilities.

1.02 REFERENCES

A. ANSI/AWI 0641-2019 - Architectural Wood Casework

B. Builders Hardware Manufacturers Association (BHMA)

1. BHMA A156.9 - American National Standard for Cabinet Hardware

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Convene a pre-installation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Product Data: Provide data for hardware accessories and countertops.

D. Samples:

1. Submit samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate.

2. Submit samples of finish options, 12 inches square.

E. Qualifications: Submit written documentation of fabricator's qualifications.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

B. Countertop Fabricator and Installer: Certified by manufacturer with five years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

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1.07 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 - PRODUCTS

2.01 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by ANSI/AWI 0641-2019 - Architectural Wood Casework, for Premium Grade.

B. Apple-Ply Plywood, or approved equal; Natural Maple species; AWI Premium Grade; plain sliced; random match; no voids; faced on both sides.

C. Manufacturer: Apple-Ply by States Industries, Europly PLUS by Columbia Forest Products, or approved equal.

D. Thickness: 3/4 inch.

E. Cabinet Style: Flush overlay.

F. Cabinet Doors and Drawer Fronts: Flush style.

G. Drawer Side Construction: Lock-jointed and nailed.

H. Drawer Construction Technique: As recommended by fabricator.

I. Finish: Clear or transparent finish to be selected from manufacturer / supplier recommended finish options.

2.02 COUNTERTOPS

A. "DuPont™ Corian® Solid Surface"

B. Thickness: 3/4 inch.

C. Edges: Eased

D. Cutouts: Ensure cutouts have rounded corners (5 mm radius minimum) and are finished smooth.

E. Backsplashes: 4 inch; Applied.

F. Support: In accordance with manufacturer's recommendations.

G. Color: As selected from manufacturer's standard.

2.03 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application, and meeting the Project's VOC requirements.

2.04 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

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B. Cabinet Hardware and Accessories: Install at mill in accordance with requirements of this Section. Include all devices, as required for complete installations. Unless otherwise indicated, provide the following, or accepted substitutions in sizes and quantities required to equip work of this Section. Include items as required, whether specifically noted or not. Submit for review and acceptance any not indicated.

1. Extension Drawer Slides: Knape & Vogt No's. 6505 and 8500 (for heavy duty purposes)

2. Hinges: Grass USA Nexus Series

3. Door and Drawer Pulls:

   a. Sugatsune DIH-128, or approved equal.

   b. Material: 304 Stainless Steel

   c. Finish: Satin

4. Magnetic Catch: Stanley CD41 and CD42 to suit conditions.

5. Adjustable Metal Shelf Standards and Brackets:

   a. Heavy Duty Oversized: K&V No. 83 standards and No. 161 ANO brackets; size as required for shelving height and depth.

   b. Regular Duty: K&V No. 80 standards and No. 180 brackets; size as required for shelving height and depth.

6. Shelf Support Pins: Knape & Vogt 346 Series

2.05 SHOP TREATMENT OF WOOD MATERIALS

A. Provide UL approved identification on fire retardant treated material.

B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.06 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Clear finish all exposed edges of shelves and doors.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.

E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

F. Shop glaze glass materials using the Interior Dry method specified in Section 08 80 00.

2.07 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

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C. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

G. Install countertops and backsplashes in accordance with manufacturer's installation instructions.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

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SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

1.02 REFERENCE STANDARDS

A. ASTM C794: Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants

B. ASTM C834: Standard Specification for Latex Sealants

C. ASTM C920: Standard Specification for Elastomeric Joint Sealants

D. ASTM C1193: Standard Guide for Use of Joint Sealants

E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, and limitations.

C. Samples: Submit two samples, 1/2 x 4 inch in size illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

E. Manufacturer and Applicator Qualifications Certification.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum 5 years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this Section with minimum 5 years documented experience.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 - PRODUCTS

2.01 SEALANTS

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

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B. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.

1. Color: To be selected by architect from manufacturer's standard range.

2. Applications: Use for:

a. Interior wall and ceiling control joints.

b. Joints between door and window frames and wall surfaces.

c. Other interior joints for which no other type of sealant is indicated.

3. Products:

a. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: www.pecora.com.

b. Approved equal.

C. Interior Wet Area Sealant: Silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.

1. Color: To be selected by architect from manufacturer's standard range.

2. Applications: Use for:

a. Joints between plumbing fixtures and floor and wall surfaces.

b. Joints between kitchen and bath countertops and wall surfaces.

3. Products:

a. Pecora Corporation; 898NST Sanitary Silicone Sealant - Class 50: www.pecora.com.

b. Approved equal.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

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3.02 PREPARATION

A. Remove existing paint coatings, loose materials and foreign matter at existing surfaces that could impair adhesion of sealant.

B. Perform adhesion testing of all substrates in accordance with ASTM C794.

C. Clean and prime joints in accordance with manufacturer's instructions.

D. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

E. Protect elements surrounding the work of this Section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION

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SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

1.02 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council.

B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.

C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames.

F. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Maintain at the project site a copy of all reference standards dealing with installation.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

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PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:

1. Steelcraft: www.steelcraft.com.
2. Ceco Door: www.cecodoor.com
3. Republic Doors and Frames: www.republicdoor.com

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:

1. Accessibility: Comply with ANSI/ICC A117.1.
2. Door Top Closures: Flush with top of faces and edges.
3. Door Edge Profile: Beveled on both edges.
4. Door Texture: Smooth faces.
5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
7. Finish: Factory primed, for field finishing.

2.03 STEEL DOORS

A. Interior Doors, Non-Fire-Rated:

1. Grade: ANSI A250.8 Level 1, physical performance Level C, Model 1, full flush.
2. Thickness: 1-3/4 inches.

2.04 STEEL FRAMES

A. General:

1. Comply with the requirements of grade specified for corresponding door.
   a. ANSI A250.8 Level 1 and 2 Doors: 16 gage frames.
   b. ANSI A250.8 Level 3 Doors: 14 gage frames.
2. Finish: Factory primed, for field finishing.
3. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 ACCESSORY MATERIALS

A. Glazing: As specified in Section 08 8000.

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B. Removable Stops for glazing: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

D. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, baked on.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

A. Coat inside of frames with bituminous coating to a thickness of 1/16 inch.

3.03 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. Coordinate frame anchor placement with wall construction.

C. Coordinate installation of hardware.

D. Coordinate installation of glazing.

E. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood doors.

B. Thresholds.

C. Weatherstripping, seals and door gaskets.

1.02 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council.

B. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc. (ANSI/BHMA A156.18).

C. DHI A115W Series - Specifications for Wood Door and Frame Preparation for Hardware; Door and Hardware Institute.

D. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute.

E. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Wood Flush Doors; Door and Hardware Institute.

F. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.

G. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association.

H. UBC Std 7-2, Part II - Test Standard for Smoke- and Draft-control Assemblies; International Conference of Building Officials.

I. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc..

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, electrical characteristics, and connection requirements.

2. Submit manufacturer's templates.

3. Submit wiring diagrams for electrified hardware.

C. Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

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D. Project Record Documents: Record actual locations of installed cylinders and their master key code.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

F. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with five years of experience. Company must have a factory direct status with all manufacturer's specified.

C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.05 PRE-INSTALLATION MEETING

A. Convene one week prior to commencing work of this section. Schedule at a time mutually agreeable by Owner's Representative, Contractor and Installer to review methods and procedures.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.07 COORDINATION

A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

B. Furnish templates for door and frame preparation.

C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

D. Coordinate Owner's keying requirements during the course of the Work.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 25 year warranty for door closers and 10 year warranty for locksets.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Hinges:

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1. Ives (IVE)
2. McKinney.
3. Stanley.

B. Lock and Latch Sets:

1. Schlage (SCH): www.schlage.com.

C. Closers:

1. LCN (LCN): www.lcnclosers.com.

D. Gasketing; Thresholds:

1. National Guard Products, Inc: www.ngpinc.com.
2. Pemko Manufacturing Co (PEM): www.pemko.com
3. Zero International.

E. Protection Plates:

1. Ives (IVE).
2. Trimco.
3. Tice.

F. Wall Stops:

1. Ives (IVE).
2. Trimco

G. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:

1. Applicable provisions of Federal, State, and local codes.
2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
3. Applicable provisions of NFPA 101, Life Safety Code.
4. Fire-Rated Doors: NFPA 80.
5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
6. Hardware for Smoke and Draft Control Doors: Provide hardware that enables door assembly to comply with air leakage requirements of UBC Std 7-2, Part II.
7. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

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8. Finishes: Identified in schedule at end of section.

2.03 KEYING

A. Keying is not necessary on this project. There are no keyed locksets.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

D. Mounting heights for hardware from finished floor to center line of hardware item:

1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00 - Quality Requirements.

B. Representative for locks and closers to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 70 00 – Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. After building is complete and air system is balanced, adjust door closers to comply with ADA, Building and Fire Codes.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

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3.06 SCHEDULE

HARDWARE GROUP NO. 01

04

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		640	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S ATH OME OS-OCC		643e	SCH
1	EA	CLOSER W/STOP ARM	1450 SCUSH STD		695	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		613	IVE
1	EA	GASKETING	488SBK PSA (FOR SOUND)		BK	ZER

HARDWARE GROUP NO. 02

05

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		640	IVE
1	EA	PASSAGE SET	ALX10 OME		643e	SCH
1	EA	CLOSER W/STOP ARM	1450 SCUSH STD		695	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		613	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39D		D	ZER
1	EA	THRESHOLD	545D-223		D	ZER

END OF SECTION

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SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Glass.

B. Glazing compounds and accessories.

1.02 REFERENCE STANDARDS

A. This Section incorporates by reference the latest revisions of the following documents.

1. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.

2. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

4. ASTM C1193 - Standard Guide for Use of Joint Sealants.

5. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

6. GANA (GM) - GANA Glazing Manual; Glass Association of North America.

7. GANA (SM) - FGMA Sealant Manual; Glass Association of North America.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Convene a pre-installation meeting one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit two samples 6 x 6 inch in size of glass units.

E. Quality Assurance: Submit Manufacturer's qualification certification.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

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B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 - PRODUCTS

2.01 GLAZING TYPES

A. Single Safety Glazing: Non-fire-rated.

1. Applications: Provide this type of glazing in the following locations:

a. Glazed lites in doors, except fire doors.

b. Glazed sidelights to doors, except in fire-rated walls and partitions.

c. Other locations required by applicable federal, state, and local codes and regulations.

d. Other locations indicated on the drawings.

2. Type: Fully tempered float glass as specified.

3. Tint: Clear.

4. Thickness: 1/4 inch.

2.02 GLASS MATERIALS

A. Float Glass: All glazing is to be float glass unless otherwise indicated.

1. Annealed Type: ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).

2. Heat-Strengthened and Fully Tempered Types: ASTM C 1048.

2.03 GLAZING COMPOUNDS

A. Manufacturers:

1. Bostik Inc: www.bostik-us.com.

2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.

3. Pecora Corporation: www.pecora.com.

4. BASF Construction Chemicals-Building Systems: www.chemrex.com.

B. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.

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C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; clear color.

2.04 GLAZING ACCESSORIES

A. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

B. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.

2.05 SOURCE QUALITY CONTROL AND TESTS

A. Provide shop inspection and testing.

B. Test samples in accordance with ANSI Z97.1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Prime surfaces scheduled to receive sealant.

C. Install sealants in accordance with ASTM C1193 and FGMA Sealant Manual.

D. Install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Comply with combined recommendations of manufacturers of glass, sealants, and metal framing systems, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass from edge damage during handling and installation

C. Remove damaged glass from project site and legally dispose of off site.

3.04 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.05 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

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3.06 SCHEDULE

A. Interior wood doors, interior hollow metal doors and sidelites as indicated on the Drawings.

END OF SECTION

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SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal channel ceiling framing.

B. Gypsum wallboard.

C. Joint treatment and accessories.

D. Acoustical sealant.

1.02 REFERENCE STANDARDS

A. ASTM C475: Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

B. ASTM C514: Standard Specification for Nails for the Application of Gypsum Board

C. ASTM C587: Standard Specification for Gypsum Veneer Plaster

D. ASTM C665: Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

E. ASTM C754: Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

F. ASTM C840: Standard Specification for Application and Finishing of Gypsum Board

G. ASTM C954: Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

H. ASTM C1002: Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

I. ASTM C1047: Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base

J. ASTM C1396: Standard Specification for Gypsum Board

K. ASTM C1658: Standard Specification for Glass Mat Gypsum Panels

L. ASTM D3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

M. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials

N. GA 216: Application and Finishing of Gypsum Board; Gypsum Association

O. Washington State Building Code

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1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

D. Test Reports: For all stud framing products that do not comply with ASTM C 645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

E. Installer Qualifications Certification.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 5 years of documented experience.

PART 2 - PRODUCTS

2.01 METAL FRAMING MATERIALS

A. A. Manufacturers - Metal Framing, Connectors, and Accessories:

1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.

2. Marino: www.marinoware.com.

3. Phillips Manufacturing Company: www.phillipsmfg.com.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.

1. Studs: "C" shaped with flat or formed webs with knurled faces.

2. Runners: U shaped, sized to match studs.

3. Ceiling Channels: C shaped.

4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. American Gypsum: www.americangypsum.com.

2. CertainTeed Corporation: www.certainteed.com.

3. USG Corporation: www.usg.com.

4. Approved equal.

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B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces, unless otherwise indicated.

2. Glass-mat-faced gypsum panels as defined in ASTM C1658, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.

3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.

4. Thickness:

a. Vertical Surfaces: 5/8 inch.

b. Multi-Layer Assemblies: Thicknesses as indicated on Contract Drawings.

C. Water-Resistant Gypsum Backing Board: Water-resistant gypsum backing board as defined in ASTM C1396; sizes to minimum joints in place; ends square cut.

1. Application: Vertical surfaces on all walls in wet areas such as restrooms, janitor closets and within 4 feet of plumbing fixtures in all other rooms.

2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. Type: Regular and Type X, in locations indicated.

4. Thickness: 5/8 inch.

5. Edges: Tapered.

D. Ceiling Board: Special sag-resistant gypsum ceiling board as defined in ASTM C1396; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings, unless otherwise indicated.

2. Thickness: 1/2 inch.

3. Edges: Tapered.

2.03 ACCESSORIES

A. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board; meeting project's VOC limits.

B. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.

1. Types: As detailed or required for finished appearance.

2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.

C. Reveals and Moldings:

1. USG 093 Control Joint, or approved equal.

D. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.

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1. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.

2. Ready-mixed vinyl-based joint compound.

E. Screws for Attachment to Steel Members Less Than 0.03 inch in Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated for exterior locations.

F. Screws for Attachment to Steel Members From 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.

G. Nails for Attachment to Wood Members: ASTM C514.

H. Acoustic Pillows: Self-contained and interlocking firestopping pillows used to fill wall openings around cable trays and other penetrations where indicated on Contract Drawings. A fire-resistive rating is not required.

1. Product: Leek Building Products SBP; www.leekbuildingproducts.com. Sizes as determined by installer.

2. Approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this Section to commence.

3.02 FRAMING INSTALLATION

A. Suspended Ceilings and Soffits: Space framing and furring members as allowed by standard.

1. Install in accordance with ASTM C754 and manufacturer's instructions.

2. Laterally brace entire suspension system.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Sealant: Install in accordance with manufacturer's instructions.

1. Place one bead continuously on substrate before installation of perimeter framing members.

2. Place continuous bead at perimeter of each layer of gypsum board.

3. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA 216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

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C. Installation on Metal Framing: Use screws for attachment of all gypsum board. Installation on Wood Framing: For non-rated assemblies, install as follows:

1. Single-Layer Applications: Screw attachment.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

D. Reveal Moulding: Install in patterns as shown on Contract Drawings according to manufacturer's instructions, directly to wall framing, or base layer of wall board in multiple layer applications.

E. Wall and Ceiling Mounted Access Hatches: Coordinate size, location and number of access hatches shown to be provided in other Specification Sections or on the Contract Drawings. Install these access hatches in gypsum board walls and ceilings in accordance with manufacturer's instructions flat and smooth in wall and ceiling surfaces.

3.06 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish, unless otherwise indicated below.

2. Level 2: In utility areas, and behind cabinetry.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

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SECTION 09 65 00

RESILIENT FLOORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient base.

C. Installation accessories.

1.02 REFERENCES

A. American Society for Testing and Materials International (ASTM)

1. ASTM F1861 - Standard Specification for Resilient Wall Base.

2. ASTM F2034 - Standard Specification for Sheet Linoleum Floor Covering.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors, and installation instructions.

C. Report recycled content and VOC emission of flooring; VOC content of adhesives.

1. For linoleum flooring, report rapidly-renewable content and urea-formaldehyde content.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Quality Assurance: Submit qualifications certification for Manufacturer and Installer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect roll materials from damage by storing on end.

1.05 FIELD CONDITIONS

A. Maintain temperature in storage area between 65 degrees F and 85 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

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PART 2 - PRODUCTS

2.01 SHEET FLOORING

A. Linoleum Sheet Flooring (LIN-1): Homogeneous wear layer bonded to backing, with color and pattern through wear layer thickness:

1. Minimum Requirements: Comply with ASTM F2034, Type corresponding to type specified.
2. Backing: Jute fabric.
3. Thickness: 2.5 mm, minimum.
4. Size: 33mx 200cm
5. Color: Shrike 324635
6. Seams: Non-welded, tight joints.
7. Manufacturers:
   a. Forbo Linoleum, Inc: www.forbo.com.
   b. Or approved equal

2.02 RESILIENT BASE

A. Resilient Base at: Resilient floor conditions - ASTM F1861, Type TS rubber, vulcanized thermoset, Cove (Toe); Carpeted areas - ASTM F1861, Type TS rubber, vulcanized thermoset, straight (Toeless); and as follows:

1. Height: 4 inch.
2. Thickness: 0.125 inch thick.
3. Lengths: 120’ coiled lengths.
4. Color: Roppe Pinnacle 140 Fawn
5. Accessories: Premolded external corners and end stops.
6. Manufacturers:
   a. Roppe Corp: www.roppe.com.
   b. Johnsonite, Inc: www.johnsonite.com.

2.03 ACCESSORIES

A. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.

1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

B. Filler for Coved Base: Plastic.

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PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

3.02 PREPARATION

A. Clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly.

3.04 SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns carefully at seams.

B. Double cut sheet at seams.

C. Lay flooring with tightly butted seams, without any seam sealer unless otherwise indicated.

D. Finish seams in linoleum by heat welding.

3.05 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

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SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 REFERENCES

A. American Society for Testing and Materials International (ASTM)

1. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

B. Carpet and Rug Institute (CRI)

1. CRI (CIS) - Carpet Installation Standard.

2. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials.

3. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors, and installation instructions.

C. Report recycled content and VOC emission of flooring; VOC content of adhesives.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Quality Assurance: Submit qualifications certification for Manufacturer and Installer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum 5 years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum 5 years experience.

1.05 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

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PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: J + J Flooring, https://www.jjflooringgroup.com/

B. Other Acceptable Manufacturers:

1. Interface FLOR, Inc., www.interfaceinc.com

2.02 MATERIALS

A. Carpet Tile (CPT-1): Manufactured in one color dye lot.

1. Pattern: Intrinsic Modular. Textured patterned loop pile.
2. Tile Size: 24" x24"
3. Gauge: 1/12" Pile thickness: .093" (2.36 mm)
4. Fiber: Solution Dyed Encore SD Ultima with 46.5% Recycled Content
5. Indoor Air Quality: Green Label Plus Certified #9716
6. Color: 2726 Inherent
7. Installation: Monolithic

B. Modular Walk off mat (WM-1): manufactured in one dye lot.

1. Pattern: Incognito Walk-off Modular
2. Tile Size: 24"x 24" nominal
3. Pile Weight: 29.0 oz per sq. yd.
4. Stitches per inch: 12
5. Fiber: Solution Dyed Encore SD Ultima with 35.9% Recycled Content
6. IAQ Green Label Plus: Green Label Plus 1098
7. Color: 1837 Operative
8. Installation: Monolithic

2.03 ACCESSORIES

A. Edge Strips: Rubber, Black color.

B. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

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B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

E. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by carpet tile manufacturer and adhesive materials manufacturer.

F. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

B. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions and CRI Carpet Installation Standard.

C. Install carpet tile in accordance with manufacturer's instructions and CRI 104.

D. Blend carpet from different cartons to ensure minimal variation in color match.

E. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

F. Lay carpet tile in brick pattern, with pile direction parallel to next unit, set parallel to building lines.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, varnishes, and other coatings.

C. Surfaces to be finished are indicated on the Drawings.

1.02 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Master Painters and Decorators Association; 2004.

1.03 REGULATORY REQUIREMENTS:

A. Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

1.05 SUBMITTALS:

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category.
   2. MPI product number (e.g. MPI #50).
   3. Cross-reference to specified paint system. (copy of relevant MPI Manual page is acceptable).

C. Submit two sets of Material Safety Data Sheets (MSDS) prior to commencement of work for review and for posting at job site as required.

D. List of all installed paints including product name, manufacturer, application and VOC content. Indicate VOC content in g/L calculated according to Green Seal Standard GS-11 and GC-03 and meeting SCAQMD RULE #1113, Architectural Coatings.

E. Samples: 8.5" x 11" painted drawdown samples of each color in the specified sheen.

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F. At project completion provide an itemized list complete with manufacturer, paint type and color-coding for all colors used for Owner's later use in maintenance.

G. Quality Assurance: Submit qualifications certification for paint contractor/Installer.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver and store all painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements in strict accordance with manufacturer and MPI requirements.

1.07 FIELD CONDTIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.08 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Supply 1 gallon of each color; store where directed.

C. Label each container with color in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

B. Acceptable Manufactures: Unless otherwise noted for particular paint systems, provide paint from the following approved manufacturers:

1. Sherwin-Williams Company
2. Miller Paint Company
3. Benjamin Moore & Co.
4. Rodda Paint
5. Approved equal.

2.02 MATERIALS - GENERAL

A. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to

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a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

B. Paints and Coatings: Provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI Categories, except as otherwise indicated.
   1. Provide ready mixed paints and coatings, except field-catalyzed coatings.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.03 PAINT SYSTEMS

A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.

B. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.

C. Where sheen is not specified or more than one sheen is specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Provide colors as directed by Architect.

2.04 PAINT SYSTEMS – INTERIOR

A. PS-1: Wood, Transparent, Low-VOC Polyurethane Varnish:

   1. One coat sealer recommended by varnish manufacturer.

   2. Satin: Two coats of varnish, MPI #128.

B. PS-2: Ferrous Metals, Primed and Unprimed, Low-VOC Latex:

   1. One coat of rust-inhibitive primer, MPI #107.

   2. Semi-gloss: Two coats of latex enamel, MPI #147.

C. PS-3: Gypsum Board/Plaster, Wet Areas (Restrooms, Showers, Janitor's rooms):

   1. One coat of PVA epoxy primer sealer, MPI #50.

   2. Semi-gloss: Two coats of epoxy enamel, MPI #215.

D. PS-4: Gypsum Board/Plaster, All Other Areas:

   1. One coat of PVA primer sealer, MPI #50.

   2. Eggshell: Two coats of latex enamel, MPI #145.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

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PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

3.03 APPLICATION:

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's instructions.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 MECHANICAL / ELECTRICAL EQUIPMENT AND RELATED SURFACES

A. Refer to Mechanical and Electrical specifications for painting, banding, stenciling of other surfaces / equipment.

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3.05 FIELD QUALITY CONTROL

A. Painted surfaces shall be considered to lack uniformity and soundness in accordance with defects noted in the MPI Painting Manual.

3.06 PROTECTION AND CLEAN-UP:

A. Protect all newly painted surfaces from elements condensation and contamination until paint coatings are completely dry. Erect barriers or screens and post signs to warn of or limit or direct traffic.

B. Touch-up damaged coatings after Substantial Completion.

C. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from site.

D. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Construction Manager.

E. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in MPI Manual.

G. Remove all spilled, splashed, splattered or over sprayed paint as work progresses, remove waste materials and keep area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

3.07 COLOR SCHEDULE

Color Schedule	
P-1	Sherwin Williams- Shoji White SW 7042
P-2	Sherwin Williams- Refuge SW 6228
P-3	Sherwin Williams- Dill SW 6438

END OF SECTION

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SECTION 10 28 00

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet room.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials International (ASTM)

1. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

3. ASTM C1036 - Standard Specification for Flat Glass.

4. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.

B. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Accessories listed are products by Bradley Corporation: www.bradleycorp.com.

B. Other Acceptable Manufacturers:

1. Bobrick Washroom Equipment, Inc: www.bobrick.com

2. A & J Washroom Accessories Inc: www.ajwashroom.com.

3. American Specialties, Inc: www.americanspecialties.com.

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2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

1. Grind welded joints smooth.

B. Keys: Provide 2 keys for each accessory to Owner; master key all lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.

E. Adhesive: Two component epoxy type, waterproof.

F. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

2.04 TOILET ROOM ACCESSORIES

A. PTD: Paper Towel Dispenser: Surface Mounted: Bradley #250-15

B. TPD: Surface Mounted Toilet Paper Dispenser: Bradley #5402

C. TSCD: Toilet Seat Cover Dispenser: Bradley #583

D. SD: Soap Dispenser:

1. Lavatory-Mounted: Bradley #6326

2. Wall Mounted (Lunch Room): Bradley #6543

E. Towel/Clothing Hooks: Bradley #9134 (Provide two on inside of door at Restroom - 124.)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify blocking / backing is in correct locations and ready for equipment mounting.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.

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B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As indicated on drawings

END OF SECTION

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SECTION 22 00 00
PLUMBING BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 DESIGN-BUILD SUMMARY

A. Work included in 22 00 00 applies to Division 22, Plumbing work to provide materials, labor, tools, permits and incidentals to make plumbing systems ready for Owner's use for proposed Project.

1.02 DESIGN-BUILD INSTRUCTIONS

A. This document is issued to give Bidders a basis for preparing a proposal to design and install a complete plumbing system for this Project.

B. Alternates to this Document may be offered as a separate proposal.

C. Bidder to submit the following information with the Proposal:

1. Preliminary drawings indicating major equipment locations and preliminary layout.

2. Description of systems, manufacturer and method of control.

3. List of materials proposed for systems which are applicable to this Project.

4. Any other information which the bidder considers pertinent in evaluating the proposal.

1.03 DESIGN-BUILD APPROACH

A. Use this Specification for design/engineering requirements, workmanship and materials or construction. Utilize design-build concept throughout construction phase of Project.

B. Investigate and be apprised of applicable codes, rules, and regulations as enforced by Authority Having Jurisdiction (AHJ).

C. Visit the Site of the proposed construction. Verify and inspect the existing site to determine conditions that affect this work.

1.04 DESIGN-BUILD CRITERIA/CALCULATIONS

A. Related Work Specified Elsewhere: Contents of Section apply to Division 22 Specifications. Requirements of Section are a minimum for Division 22 Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.

B. Design Criteria: Reference Basis of Design narrative document.

C. Design Criteria:

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1. Size storm, waste, water and vent piping in accordance with State Plumbing code and local jurisdiction requirements.

2. Storm and waste piping to be routed at 1/4-inch per foot unless specifically noted otherwise. Obtain approval from local authorities for piping, with slope less than 1/4 per foot.

3. Size domestic water piping with a maximum pressure drop of 2 PSI per 100 feet and a maximum velocity of 6 feet per second for hot and cold water. For hot water return calculate maximum velocity no greater than 4 ft/second. Service to be 2-inches minimum. Provide larger service if required per UPC fixture unit calculation. Piping mains inside building to be above ceiling.

4. Provide rough-in and connections for waste, water and vents for fixtures. Coordinate and site verify actual location of rough-in with Contractor and Architect.

5. Provide cold water valved tap as required. Minimum 3/4-inch service. Provide ball valve in branch piping. Connect fixtures shown to main waste, water and vent systems.

6. Provide adjustable temperature setting "Insta-hot," or approved, at each lavatory.

7. Provide pressure-reducing station on incoming water supply, where service pressure exceeds 80 PSI static. 20 minimum flow. 80 maximum flow. Provide unions, strainers and drain valves.

8. Provide acoustical components/methods for plumbing systems installation coordinated with Project Acoustical Engineer.

D. Calculations:

1. Submit the following Plumbing Calculations:

   a. Water Sizing Calculations.

   b. Sanitary Drainage Calculations.

   c. Storm Drainage Calculations.

   d. Structural Calculations for Seismic Bracing of Plumbing Equipment and Piping.

   e. Rainwater Harvesting Calculations.

   f. Hot Water Heater Calculations.

2. Structural calculations to be signed by a registered Engineer in the State of Oregon.

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1.05 SECTION INCLUDES

A. Work included in 22 00 00, Plumbing Basic Requirements applies to Division 22, Plumbing work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of plumbing systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.

2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.

3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.

4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.

5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.06 RELATED SECTIONS

A. Contents of Section applies to Division 22, Plumbing Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:

a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

b. Drawings

c. Addenda

d. Owner/Architect Agreement

e. Owner/Contractor Agreement

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f. Codes, Standards, Public Ordinances and Permits

1.07 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, individual Division 22, Plumbing Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:

a. OAR - Oregon Administrative Rules

b. 2023 OESC - Oregon Electrical Specialty Code

c. 2022 OFC - Oregon Fire Code

d. 2022 OMSC - Oregon Mechanical Specialty Code

e. 2023 OPSC - Oregon Plumbing Specialty Code

f. 2022 OSSC - Oregon Structural Specialty Code

g. 2021 OEESC - Oregon Energy Efficiency Specialty Code

h. 2024 Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:

1. ABA - Architectural Barriers Act

2. ADA - Americans with Disabilities Act

3. AHRI - Air-Conditioning Heating & Refrigeration Institute

4. ANSI - American National Standards Institute

5. ASCE - American Society of Civil Engineers

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

7. ASHRAE Guideline 0, the Commissioning Process

8. ASME - American Society of Mechanical Engineers

9. ASPE - American Society of Plumbing Engineers

10. ASSE - American Society of Sanitary Engineering

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11. ASTM - ASTM International
12. AWWA - American Water Works Association
13. CFR - Code of Federal Regulations
14. CGA - Compressed Gas Association
15. CISPI - Cast Iron Soil Pipe Institute
16. ETL - Electrical Testing Laboratories
17. EPA - Environmental Protection Agency
18. FM - FM Global
19. IAPMO - International Association of Plumbing and Mechanical Officials
20. GAMA - Gas Appliance Manufacturers Association
21. HI - Hydraulic Institute Standards
22. ISO - International Organization for Standardization
23. MSS - Manufacturers Standardization Society
24. NEC - National Electric Code
25. NEMA - National Electrical Manufacturers Association
26. NFGC - National Fuel Gas Code
27. NFPA - National Fire Protection Association
28. NRCA - National Roofing Contractors Association
29. NSF - National Sanitation Foundation
30. OSHA - Occupational Safety and Health Administration
31. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
32. TEMA - Tubular Exchanger Manufacturers Association
33. TIMA - Thermal Insulation Manufacturers Association
34. UL - Underwriters Laboratories Inc.

D. See Division 22, Plumbing individual Sections for additional references.

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1.08 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 22, Plumbing Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:

1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. At Contractor's option, two separate submittals may be provided, consisting of underground work and building work. Deviations will be returned without review.

3. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 22, Plumbing Sections.

4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.

a. Label submittal to match numbering/references as shown in Contract Documents and schedules. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.

b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference Division 22, Plumbing Sections for specific items required in product data submittal outside of these requirements.

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c. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.

d. For vibration isolation of equipment, list make and model selected with operating load and deflection. Indicate frame type where required. Submit manufacturer's product data.

e. See Division 22, Plumbing Sections for additional submittal requirements outside of these requirements.

5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to Contractor without review.

6. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment or ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.

7. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 22, Plumbing Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.

8. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

9. Substitutions and Variation from Basis of Design:

a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.

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b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

10. Shop Drawings: Provide coordinated Shop Drawings which include physical characteristics of all systems, equipment and piping layout plans, and control wiring diagrams. Reference individual Division 22, Plumbing Sections for additional requirements for Shop Drawings outside of these requirements.

    a. Provide Shop Drawings indicating sanitary and storm cleanout locations and type to Architect for approval prior to installation.

    b. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.

11. Samples: Provide samples when requested by individual Sections.

12. Resubmission Requirements:

    a. Make corrections or changes in submittals as required in response to Engineer’s comments. Provide a cover letter with resubmittal that includes responses to each of the Engineer’s submittal review comments and identifies changes in the resubmittal. Cloud changes in the submittals.

        1) Resubmit for review until review indicates “no exception taken” or “make corrections noted.”

        2) When submitting drawings for Engineer's re-review, clearly indicate changes on drawings and cloud any revisions. Submit a list describing each change.

13. Operation and Maintenance Manuals, Owner's Instructions:

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a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.

1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.

2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.

3) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.

4) Include copy of startup and test reports specific to each piece of equipment.

5) Include copy of final water systems balancing log along with pump operating data.

6) Include commissioning reports.

7) Include copy of pressure, flow, leakage and purity test data and air and water systems test data, as applicable. Include copy of third-party and state and local jurisdiction inspection reports.

8) Include copy of valve charts/schedules.

9) Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

10) Include product certificates of warranties and guarantees.

11) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

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b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 22 00 00, Plumbing Basic Requirements article titled "Demonstration."

c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

14. Record Drawings:

a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for Project.

c. At completion of project, input changes to original project Revit Model and make one set of black-line drawings created from Revit model in version/release equal to contract drawings. Submit Revit model and drawings upon substantial completion.

d. Provide Invert elevations and dimensioned locations for water services, building waste, and storm drainage piping below grade extending to 5-feet outside building line.

e. See Division 22, Plumbing individual Sections for additional items to include in record drawings.

1.09 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

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C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturers equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

G. Piping Insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

H. All potable water system components, devices, material, or equipment containing a weighted average of greater than 0.25 percent lead are prohibited and shall be certified in accordance with current editions of the Safe Drinking Water Act (SDWA), NSF 61 & NSF 372. Endpoint devices used to dispense water for drinking shall meet the requirements of NSF 61.

I. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.

J. Unless specifically noted otherwise in the contract documents, all valves, devices, appurtenances, and sundries are to match connection size of piping in which they are installed. Where equipment/devices from manufacturer vary from the adjoining pipe size, transition fittings are to be used.

1.10 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Contracting and Procurement Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty in Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

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1.11 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, plumbing equipment/fixtures, fire sprinklers, plumbing, cable trays, lights, and electrical services with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in the event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

1.12 WORK INCLUDED

A. Furnish and install sleeves, inserts and anchorage required for the installation, which are embedded in work of other trades. Sleeve, wrap and seal piping in concrete.

B. Electrical: For plumbing trim/devices/equipment, provide, from the line voltage connection by Division 26, the low voltage electrical connections and wiring as required for complete and operable system. Includes, but is not limited to: Low voltage electrical raceway, wiring and accessories, such as step-down transformers as necessary for function of sensors and automatic valve and faucet controls. Supply step-down transformers and size wiring as recommended by manufacturer of plumbing trim/faucets requiring electrical low voltage connection.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to fixtures, pumps, drains and equipment.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:

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1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.

2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.

3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Install equipment requiring access (i.e., drain pans, drains, control operators, valves, motors, cleanouts and water heaters) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Earthwork:

1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:

a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with the provisions of related earthwork Sections/divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.

b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.

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c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:

1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:

a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Pipe Installation:

1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating for coordinating installation of piping systems.

2. Include provisions for servicing and removal of equipment without dismantling piping.

G. Plenums:

1. Provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, Section 22 05 48, Vibration and Seismic Controls for Plumbing Piping and Equipment, and individual Division 22 Plumbing Sections.

B. Equipment Importance Factor: See Seismic Design Summary Table on Drawings for Importance Factors and Special Inspections Requirements.

C. General:

1. Earthquake resistant designs for Plumbing (Division 22) equipment and distribution, i.e. motors, plumbing systems, piping, equipment, water heaters, boilers, etc. to conform to regulations of jurisdiction having authority.

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2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.

4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

D. Piping:

1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.

E. Provide means to prohibit excessive motion of plumbing equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1. Underground piping installation prior to backfilling.

2. Prior to covering walls.

3. Prior to ceiling cover/installation.

4. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system. If Contractor fails to notify Architect at times prescribed above, costs incurred by removal of such work are the responsibility of the Contractor.

D. Final Punch:

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1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Plumbing Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the plumbing systems are ready for final punch.

2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:

1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).

2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.

3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.

4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing piping and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.

5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.05 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

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3.06 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:

1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.

2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.

3. Protect bright finished shafts, bearing housings and similar items until in service.

3.07 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.08 CLEANING

A. Confirm cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

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3.09 INSTALLATION

A. Confirm installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

1. Do not place equipment in sustained operation prior to initial balancing of plumbing systems.

2. Provide pump impellers to obtain Basis of Design design capacities.

D. Provide miscellaneous supports/metals required for installation of equipment and piping.

3.10 PAINTING

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 22, Plumbing Sections and the following:

1. Ferrous Metal: After completion of plumbing work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt for exterior or black enamel for interior, suitable for hot surfaces.

2. In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.

3. See individual equipment Specifications for other painting.

4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.

5. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.

6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

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3.11 DEMOLITION

A. Confirm Demolition requirements in Division 01, General Requirements and Division 02, Existing Conditions. In absence of specific requirements, comply with individual Sections in Division 22, Plumbing and the following:

1. Scope:

a. It is the intent of these documents to provide necessary information and adjustments to plumbing system required to meet code and accommodate installation of new work.

b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.

c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.

2. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.

3. Unless specifically indicated on Drawings, remove exposed, unused piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap piping and patch surfaces to match surrounding finish.

4. Unless specifically indicated on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).

3.12 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Sections in Division 22, Plumbing and the following:

1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:

a. Testing and Balancing Reports

b. Cleaning

c. Operation and Maintenance Manuals

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d. Training of Operating Personnel

e. Record Drawings

f. Warranty and Guaranty Certificates

g. Start-up/Test Document and Commissioning Reports

3.13 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 22 00 00, Plumbing Basic Requirements and individual Division 22, Plumbing Sections.

B. Tests:

1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.

2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.14 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize plumbing equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

END OF SECTION

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SECTION 22 05 16
EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Flexible Pipe Connectors, Copper Piping
2. Flexible Expansion Loop (for Thermal and Seismic Applications), Copper Piping
3. Expansion Joints, Two-Ply Bellows Type Copper Pipe

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements. Include items listed below.

B. In addition, provide:

1. Shop drawings for review and approval by Engineer. Illustrate Design Data and Expansion Joints items below on the Shop Drawing Submittal.
2. Design Data: Indicate selection calculations.
3. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
4. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.
5. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    a. Extra Packing for Packed Expansion Joints: One set for each joint.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

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1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Flexible Pipe Connectors, Copper Piping:

1. Mercer Rubber Company
2. Metraflex Company
3. Mason
4. Hyspan
5. Or approved equivalent.

B. Flexible Expansion Loop (for Thermal and Seismic Applications), Copper Piping:

1. Mercer Rubber Company
2. Metraflex Company
3. Mason
4. Hyspan
5. Or approved equivalent.

C. Expansion Joints, Two-Ply Bellows Type Copper Pipe:

1. Mercer Rubber Company
2. Metraflex Company
3. Mason
4. Hyspan
5. Or approved equivalent.

2.02 FLEXIBLE PIPE CONNECTORS, COPPER PIPING

A. Inner Hose: Bronze, close pitch, annular corrugated hose.

B. Exterior Sleeve: Braided bronze (piping over 2-inches to be 3-pound braided stainless steel).

C. Pressure Rating: 125 PSI at 70 degrees F with a 4 to 1 safety factor.

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D. Joint: Sweat ends.

E. Size: Use pipe sized units.

F. Maximum offset: 3/8-inch on each side of installed center line.

G. Basis of Design: Metraflex Model BBS.

2.03 FLEXIBLE EXPANSION LOOP (FOR THERMAL AND SEISMIC APPLICATIONS), COPPER PIPING

A. Construction: Two flexible sections of hose and braid, two 90 degree elbows and a 180 degree return designed so piping does not change direction, but maintains course along a single axis. Use Vee Loop where space is limited. System to import no thrust loads to system support anchors or building structure.

B. Inner Hose: Bronze, close pitch, annular corrugated hose.

C. Exterior Sleeve: Braided bronze.

D. Pressure Rating: 125 PSI at 70 degrees F with a 4 to 1 safety factor.

E. Joint: Sweat ends.

F. Size: Use pipe sized units.

G. Support: Center support at bottom of 180 degree return.

H. Basis of Design: Metraflex Metraloop. Vee configuration Mason-Mercer VCPSB.

2.04 EXPANSION JOINTS, TWO-PLY BELLOWS TYPE COPPER PIPE

A. Construction: Laminated bellows ASTM A240 Type 321 stainless steel, copper tube ASTM B88, ASTM A240 Type 321 stainless steel housing and guide, anti-torque device, limit stops, internal guides

B. Working Pressure: 200 PSI.

C. Maximum Temperatures: 500 degrees F.

D. Maximum Compression: 2-inches.

E. Maximum Extension: 1/2-inch.

F. Joint: Sweat ends. ASME B16.22.

G. Size: Use pipe sized units. Maximum 4-inch pipe.

H. Basis of Design: Hyspan Model 8509, 8510.

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PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Expansion/Contraction Fitting Installation:

1. Install expansion/contraction fittings according to manufacturer's written instructions.

2. Install expansion/contraction fittings in sizes matching pipe size in which they are installed.

3. Align expansion/contraction fittings to avoid end-loading and torsional stress.

4. Install in accordance with EJMA (Expansion Joint Manufacturer's Association) Standards.

5. Wood structures: install expansion/contraction fittings and guides at every floor.

6. Concrete structures: install expansion/contraction fittings and guides at interval spacing recommended by the manufacturers.

B. Pipe Bend and Loop Installation:

1. Install pipe bends and loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

2. Attach pipe bends and loops to anchors.

a. Steel Anchors: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code Section IX, "Welding and Brazing Qualifications."

b. Concrete Anchors: Attach by fasteners. Follow fastener manufacturer's written instructions.

C. Swing Connections:

1. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.

2. Connect mains, risers and branch connections to equipment with at least four pipe fittings, including tee in riser.

D. Guide Installation:

1. Install guides on piping adjoining expansion fittings and loops.

2. Attach guides to pipe and secure to building structure.

E. Anchor Installation:

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1. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

2. Fabricate and install steel anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and AWS D1.1.

3. Construct concrete anchors of poured-in-place concrete of dimensions indicated and include embedded fasteners.

4. Install pipe anchors according to expansion fitting manufacturer's written instructions if expansion fittings are indicated.

5. Use grout to form flat bearing surfaces for expansion fittings, guides, and anchors installed on or in concrete.

F. Painting:

1. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA1 requirements for touching up field-painted surfaces.

a. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

2. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

3.02 FLEXIBLE PIPE CONNECTORS, COPPER PIPING

A. See General Installation Requirements above.

B. Install per manufacturer's written recommendations and requirements.

3.03 FLEXIBLE EXPANSION LOOP (FOR THERMAL AND SEISMIC APPLICATIONS), COPPER PIPING

A. See General Installation Requirements above.

B. Install per manufacturer's written recommendations and requirements.

3.04 EXPANSION JOINTS, TWO-PLY BELLOWS TYPE COPPER PIPE

A. See General Installation Requirements above.

B. Install per manufacturer's written recommendations and requirements.

END OF SECTION

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SECTION 22 05 19
PLUMBING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Pressure Gauges
2. Thermometers
3. Water Hammer Arrestors (Shock Absorbers)
4. Trap Primers

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements apply to this Section.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Pressure Gauges:

1. Dwyer Instruments, Inc.
2. Moeller Instrument Co., Inc.
3. Omega Engineering, Inc.

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4. Trerice

5. Or approved equivalent.

B. Thermometers:

1. Ashcroft

2. Trerice

3. Weiss

4. Marshaltown

5. Weksler

6. Or approved equivalent.

C. Water Hammer Arrestors (Shock Absorbers):

1. Bellows Type:

a. Amtrol

b. J.R. Smith

c. MIFAB

d. Wade

e. Zurn

f. Or approved equivalent.

2. Piston Type:

a. MIFAB

b. PPP

c. Sioux Chief

d. Or approved equivalent.

D. Trap Primers:

1. J.R. Smith

2. MIFAB

3. PPP

4. Wade

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5. Zurn

6. Or approved equivalent.

2.02 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, phosphor-bronze bourdon type, dry type.

1. Case: Cast aluminum, stem-mounted, flange less.

2. Size: 4-1/2-inch diameter.

3. Window: Clear glass.

4. Connector: Brass.

5. Scale: White aluminum with black graduation and markings.

6. Pointer: Black, adjustable.

7. Mid-Scale Accuracy: One percent.

8. Scale: PSI and KPa.

9. Basis of Design: Trerice Model 600CB.

2.03 THERMOMETERS

A. Thermometers - Adjustable Angle: Red or blue appearing organic liquid in glass, ASTM E 1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.

1. Size: 9-inch scale.

2. Window: Acrylic.

3. Scale: Aluminum, white background, black graduations and markings.

4. Stem: 3/4-inch NPT brass.

5. Accuracy: 2 percent, per ASTM E 77.

6. Calibration: 0-160 with 2 Degrees F graduations.

7. Basis of Design: Trerice BX9.

2.04 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

A. Bellows-type, stainless steel casing and bellows, pressure rated, tested and certified in accordance with PDI WH-201 or ASSE 1010.

B. Piston-type, copper, brass or stainless steel with O-ring piston, pressure rated, tested and certified in accordance with PDI WH-201 or ASSE 1010.

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2.05 TRAP PRIMERS

A. Automatic trap primer assemblies meeting governing code requirements. Provide with air-gap fittings as required.

B. Electronic trap seal automatic primer valve with integral anti siphon protection and timer or tied to BAS system as designated on Drawings. Coordinate quantity, locations, and voltage characteristics or control points.

C. Trap seal primer valve (low lead) with integral automatic anti-siphon protection. The priming valve to discharge on both pressure drop and pressure spike. PPP CPO 500.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. For plumbing devices requiring access from access panels (i.e. trap primers, water hammer arrestors and the like) submit location/size of all access panels to Architect for approval prior to purchase and installation of access panel. See Section 22 00 00, Plumbing Basic Requirements for additional requirements.

B. Provide instruments with scale ranges selected according to service with largest appropriate scale.

C. Install per manufacturer recommendations.

3.02 PRESSURE GAUGES

A. Install pressure gauge where exposure to heat and vibration are minimal and where the dial can be easily read. It is also important to install the gauge in a location with undisturbed and continuous flow of the pressure medium.

B. Provide a needle valve or gauge cock, installed between the process and the pressure gauges.

C. Install pressure gauges in piping tee with pressure gauge cock, in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

D. Locations: Install in the following locations, and elsewhere as indicated.

1. At each pump inlet and outlet.

2. At inlet and discharge of each pressure reducing valve.

3. At make-up water service outlets.

4. At inlets and outlets of all master mixing valves.

E. Adjust gauges to final angle, clean windows and lenses, and calibrate to zero.

F. Install per manufacturer recommendations.

G. Pressure Gauge Range/Graduations:

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1. Cold Water: 0-100 PSI; graduation 1 PSI.

2. Hot Water: 0-100 PSI; graduation 1 PSI.

3.03 THERMOMETERS

A. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2-inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

B. Install thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

C. Adjust thermometers to final angle, clean windows and lenses, and calibrate to zero.

D. Install per manufacturer recommendations.

E. Thermometer Range/Graduations:

1. Cold Water: 25-125 degrees F; graduation 1 degree F.

2. Hot Water: 30-240 degrees F; graduation 2 degrees F.

3.04 WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

A. Install in upright position, in locations and of sizes in accordance with PDI WH-201 or ASSE 1010, and elsewhere as indicated.

B. Locate shock absorbers in supply pipe in accordance with recommendations of Plumbing and Drainage Institute PDI-WH201 or ASSE 1010. Install ahead of solenoid operated valves. Determine size of absorber by fixture unit value of fixture supplied, using PDI symbols to designate sizes. Provide access panel for each shock absorber.

C. Install per manufacturer recommendations.

3.05 TRAP PRIMERS

A. Flush supply line prior to installation.

B. Install valve plumb using caution to not over-tighten.

C. Effective operating range 20 to 80 PSIG (138 to 552 kPa).

D. Do not subject trap primer valve to pressure in excess of 125 PSI.

E. Install trap primer per manufacturer's instructions. Install primer outlets a minimum of 12-inches above finished floor. For installations with primer lines in excess of 20 feet in length, the primer assembly should be raised 12-inches for each additional 20 feet of length. Maximum 80 feet primer length unless specifically approved by design engineer.

F. Install primers at locations as indicated on Drawings. Extend primer lines to all trapped drains that are tied to sanitary.

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G. Provide the number of primer assemblies required at each primer "location" to feed the number of primer lines at that location.

H. For electronic primers assemblies, coordinate required electrical connections with Division 26; coordinate required Building Automation System (BAS) with Division 23 "Controls."

END OF SECTION

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SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Valves, General
2. Balancing Valves
3. Ball Valves
4. Swing Check Valves
5. Backflow Prevention Assemblies
6. Pressure Regulating Valve - Domestic Water
7. Thermostatic Master Mixing Valves (ASSE 1017 Rated)
8. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated)
9. Thermostatic Emergency Mixing Valves (ASSE 1071 Rated)

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. NSF 61, Annex G and/or NSF/ANSI 372 for potable water services. Valves must be 3rd-party certified.
2. ISO 9001 Certified.

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3. IAPMO Certified for Low Lead.

C. Source Limitations for Valves: Obtain each type of valve from a single source and from a single manufacturer.

D. Model numbers indicated as Basis-of-Design indicate valve characteristics. All valves are to meet code Low Lead/Lead Free Standards.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Valves: Obtain each type of valve from a single source and from a single manufacturer.

B. Valves, General:

1. Apollo
2. Armstrong
3. ASCO
4. Caleffi
5. Cla-Val
6. Conbraco
7. Crane
8. Clow
9. Griswold
10. Hammond
11. Hays
12. Jenkins
13. Josam
14. Kennedy
15. Milwaukee
16. Mueller

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17. Nibco
18. Red-White Valve
19. Smith
20. Stockham
21. Tour Anderson
22. Wade
23. Watts
24. Wilkins
25. Zurn
26. Or approved equivalent.

C. Balancing Valves:

1. Caleffi
2. Griswold
3. Hays
4. Armstrong CBV
5. Tour Anderson
6. Or approved equivalent.

D. Ball Valves:

1. See Valves, General above.
2. NSF Valves:
   a. Clow
   b. Kennedy
   c. Nibco
   d. Or approved equivalent.

E. Swing Check Valves:

1. See Valves, General above.

F. Backflow Prevention Assemblies:

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1. Backflow Preventers:

   a. Apollo

   b. Cla-Val

   c. Conbraco

   d. Watts

   e. Or approved equivalent.

2. Backflow Prevention Assemblies - Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications - 2-inches and Smaller:

   a. Febco 860-with 650A.

   b. Conbraco 40-210-AGD.

   c. Wilkins 375-XL-SAG.

   d. Watts 919-QT-S valve with 919AGC or 919AGF.

   e. Or approved equivalent.

3. Backflow Prevention Assemblies - Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications - 2-1/2-inches and Larger:

   a. Febco 860 with 758A.

   b. Conbraco Apollo 40-700 with 758A.

   c. Watts 909-S-NFA-NRS with AGC.

   d. Wilkins 375-FSC.

   e. Or approved equivalent.

4. Backflow Prevention Assemblies - Double Check Valve Assembly (DCVA) for Low Hazard Applications - 2-inches and Smaller:

   a. Febco 850-650A

   b. Conbraco Apollo 40-110-T2

   c. Watts 007-QT-FDA-S

   d. Wilkins 350-S-XL

   e. Or approved equivalent.

5. Backflow Prevention Assemblies - Double Check Valve Assembly (DCVA) for Low Hazard Applications - 2-1/2-inches and Larger:

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a. Conbraco Apollo 45-11-1

b. Watts LF-709 with 77F-01-FDA-12

c. Or approved equivalent.

6. Spill Resistant Pressure Vacuum Breaker:

a. Febco

b. Conbraco

c. Watts

d. Wilkins

e. Or approved equivalent.

7. Atmospheric Vacuum Breakers:

a. Febco

b. Conbraco

c. Watts

d. Wilkins

e. Or approved equivalent.

G. Pressure Regulating Valve-Domestic Water:

1. Cash Acme

2. Cla-Val

3. Watts

4. Wilkins

5. Or approved equivalent.

H. Thermostatic Master Mixing Valves (ASSE 1017 Rated):

1. Caleffi

2. Holby Tempering Valve

3. Lawler Series 66

4. Leonard Type TM

5. Powers LFMM430 (Lead Free)

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6. Symmons Temp Control Series 5

7. Or approved equivalent.

I. Thermostatic Point-of-Use Mixing Valves (ASSE 1070 Rated):

1. Caleffi

2. Lawler

3. Leonard

4. Powers Hydroguard

5. Or approved equivalent.

J. Thermostatic Emergency Mixing Valves (ASSE 1071 Rated):

1. Acorn Controls

2. Leonard Valve

3. Lawler

4. Powers

5. Or approved equivalent.

2.02 VALVES - GENERAL

A. General:

1. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.

2. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves 6-inches and smaller. Provide gear operators for quarter-turn valves 8-inches and larger and plug valves installed over 5-feet above finished floor.

3. Valve Identification: Manufacturer's name (or trademark) and pressure rating clearly marked on valve body.

B. Valves in Insulated Piping: With 2-inch stem extension and following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation on valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.

C. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.

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2. Solder Joint: With sockets according to ASME B16.18.

3. Threaded: With thread according to ASME B1.20.1.

D. Valve Bypass and Drain Connections: MSS SP-45.

E. Building Service:

1. Shutoff and Isolation Valves:

a. Pipe Sizes 3-inches and Smaller: Ball Valve.

2. Drain Service: Ball Valves.

3. Strainer Blow-Off: Ball Valve.

4. Check Valves: Swing.

2.03 BALANCING VALVES

A. Maximum 125 PSIG System Working Water Pressure.

B. Manual Set Balancing Valves:

1. Valves are to be of the "Y" pattern, equal percentage globe-style and provide three functions:

a. Precise flow measurement.

b. Precision flow balancing.

c. Positive drip-tight shut-off.

2. Valve to provide multi-turn, 360 degree adjustment with micrometer type indicators located on the valve handwheel. Valves have a minimum of five full 360 degree handwheel turns. 90 degree circuit-setter style ball valves are not acceptable. Valve handle to have hidden memory feature, which will provide a means for locking the valve position after the system is balanced. Valves to be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi to have two 1/4-inch threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves to be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem and plug to be brass. The handwheel to be high-strength resin.

3. 2-1/2-inch and Larger: Valves are to be of the "Y" pattern, equal percentage globe-style and provide three functions:

a. Precise flow measurement.

b. Precision flow balancing.

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c. Positive drip-tight shut off. Valve to provide multi-turn, 360 degree adjustment with micrometer type indicators location on the valve handwheel. Valves to have a minimum of five full 360 degree handwheel turns. 90 degree circuit-setter style ball valves are not acceptable. Valve handle to have hidden memory feature, which will provide a means for locking the valve position after the system is balanced. Valve body to be either cast iron with integrated cast iron flanges (2-1/2-inch to 12-inch) or ductile iron with industrial standard grooved ends (2-1/2-inch to 12-inch). Valve stem and plug disc to be bronze with handwheel that permits multi-turn adjustments. Sizes 2-1/2-inch and 3-inch: five turns; sizes 4-inch to 6-inch: 6 turns; sizes 8-inch to 10-inch: 12 turns; and size 12-inch: 14 turns. Flange adapters to be provided to prevent rotation.

2.04 BALL VALVES

A. All ball valves on brazed piping are to be three-piece.

B. 2-1/2 Inches and Smaller: MSS SP-110, 400-600 PSI, two-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 77CLF 100 Series two-piece.

C. 3 Inches and Larger: MSS SP-110, 400-600 PSI, three-piece full port ball configuration, bronze body, extended soldered ends for copper pipe and threaded ends for iron pipe, lead-free brass or stainless steel ball, lead-free brass stem, Teflon seat, extended steel handle. Apollo 82-100/82A 140 Series three-piece.

D. Full Port Ball Valve: 2- to 4-inch ductile iron, ASTM A536, micro finish steel chrome plated or stainless steel ball and stem. TFE seats, 600 PSI.

2.05 SWING CHECK VALVES

A. 2-inches and Smaller: Class 125, bronze body, horizontal swing, regrinding type, Y-pattern, renewable disc. Nibco 413. MSS SP-80.

B. 2-1/2-inches and Larger: Class 125, iron body, bolted bonnet, horizontal swing, renewable seat and disc, flanged ends. Nibco F918. MMS SP-71.

C. Rubber Flapper Check Valve: Horizontal or vertical upward flow installation. Working pressure to 175 PSI. Ductile iron or cast iron body. Steel reinforced Buna-N rubber flapper epoxy coating on wetted parts. MSS SP-80.

D. Gruvlok Series 7800 Check Valve: Horizontal installation. Working pressure to 300 PSI, Type 304/302 Stainless Steel conforming to ASTM 167. Ductile body, ASTM A536, and stainless clapper, EPDM, nitrile or optional viton bumper and bonnet seals. Stainless wetted parts.

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2.06 BACKFLOW PREVENTION ASSEMBLIES

A. General: Assemblies model numbers listed below are for general comparison. Project specific model numbers to be verified contractor as approved by jurisdiction where project is located.

B. Reduced Pressure Zone Backflow Preventer (RPBP) for High Hazard Applications:

1. 2-inches and Smaller: Assembly consists of shutoff ball valves in inlet and outlet, and strainer on inlet. Assemblies include test cocks and pressure-differential relief valve located between two positive seating check valves and comply with requirements of ASSE Standard 1013 and AWWA C511. Bronze construction, threaded ends, stainless steel internal parts, FDA strainer, and air gap fitting. Route pipe from air gap fitting to approved waste receptor.

2. 2-1/2-inches and Larger: Assembly consists of shutoff OS&Y gate valves in inlet and outlet, and strainer on inlet. Assemblies include test cocks and pressure-differential relief valve located between two positive seating check valves and comply with requirements of ASSE Standard 1015 and AWWA C511. Epoxy coated cast iron body construction, flanged ends, stainless steel internal parts, bronze seats, and FDA strainer.

C. Double Check Valve Assembly (DCVA) for Low Hazard Applications:

1. 2-inches and Smaller: Assembly consists of shutoff ball valves in inlet and outlet, and FDS strainer on inlet. Assemblies include test cocks and two positive seating check valves and comply with requirements of ASSE Standard 1015 and AWWA C510. Bronze construction, threaded ends, and stainless steel internal parts.

2. 2-1/2-inches and Larger: Assembly consists of shutoff OS&Y gate valves in inlet and outlet, and strainer on inlet. Assemblies include test cocks and two positive seating check valves and comply with requirements of ASSE Standard 1015 and AWWA C510. Epoxy coat cast iron body construction, strainer flanged ends, and stainless steel internal parts.

D. Spill Resistant Pressure Vacuum Breaker: Watts Model 800MCQT with 777S "Y" strainer.

E. Atmospheric Vacuum Breaker: Assembly consists of a bronze vacuum breaker body with silicone disc, and full size orifice. Device to be IAPMO listed, meet ASSE standard 1001, and ANSI standard A113.1.1 rough chrome plate finish.

2.07 PRESSURE REGULATING VALVE - DOMESTIC WATER

A. Water: Bronze body, diaphragm or piston type, spring actuated, with separate or integral stainless steel strainer, pressure range to suit conditions, approved for potable water use, low lead. Provide shutoff valves, pressure relief valves, unions, drain valve and bypass.

B. Water: Automatic control pressure regulating valve, stainless steel seat, stem and spring, diaphragm actuated with brass body, hydraulic control pilots with effluent operating temperature range 32 degrees F to 180 degrees F, FDA and AWWA approved.

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C. Water: Bronze body construction, stainless steel strainer screen, thermal expansion bypass with renewable stainless steel seat and high temperature resisting diaphragm.

2.08 THERMOSTATIC MASTER MIXING VALVES (ASSE 1017 RATED)

A. Thermostatic type with bronze body construction, corrosion resistant materials, union end stops, check inlets with strainers, 0-200 degree F dial thermometer and discharge shut-off valve. Mixing valves to meet ASSE 1017.

B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing requirements.

C. Flow from the tempered water circulating pump to be split to mixing valve and building hot water heating system.

2.09 THERMOSTATIC POINT-OF-USE MIXING VALVES (ASSE 1070 RATED)

A. Thermostatic type with bronze body construction, corrosion resistant materials, union end stops, check inlets with strainers, 0-200 degree F dial thermometer and discharge shut-off valve. Mixing valves to meet ASSE 1070.

B. Maximum required delta temperature differential between hot water supply temperature and delivery temperature is 15 degrees F. Set valve outlet temperature per drawing requirements.

2.10 THERMOSTATIC EMERGENCY MIXING VALVES (ASSE 1071 RATED)

A. Thermostatic type with lead-free brass or bronze construction, corrosion resistant internal components, threaded check inlets with integral screens, 0-200 degrees F dial thermometer and inlet and outlet isolation valves. Mixing valves to meet ASSE 1071.

B. The sensor will be an advanced paraffin actuator with a temperature range of 60 degrees F to 95 degrees F, factory set to 85 degrees F. The temperature adjustment will be furnished with a lock mechanism to prevent unauthorized or accidental adjustment. Use the factory set point unless noted otherwise.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, and weld ends.

3. Set ball valves open to minimize exposure of functional surfaces.

4. Block check valves in either closed or open position.

B. Use the following precautions during storage:

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1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Inspect the shipping container before unpacking to look for damage that could have occurred during transport, and report it to the transportation company immediately. After visual inspection, remove the valve from the shipping container. Make sure the faces are free of any scratches and that there is not any obvious damage to the actuator assembly or valve body.

D. Make sure to note the valve's model number during the unpacking process. The model number will need to be provided when purchasing replacement parts.

E. Purge and clean all piping to be connected to valve.

F. Install per manufacturer's recommendations.

G. Determine that the valve and its plumbing piping is adequately supported when installed. If a valve is not adequately supported, this could prevent the valve from operating and sealing correctly. Be sure that all mating flanges are in line and parallel to minimize straining on joints and valve body.

H. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

I. Do not attempt to repair defective valves; replace with new valves.

J. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

K. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose end adapter and cap on chain for each valve that must be installed with stem below horizontal plane. Ensure installation provides full stem movement.

L. Insulation: Where insulation is indicated, install extended stem valves, arranged in proper manner to receive insulation.

M. Mechanical Actuators: Install with chain operators where indicated. Extend chains to 5-feet above floor and hook to clips to clear aisle passage.

N. Stem Selection: Outside screw and yoke stems, except provide inside screw, non-rising stem where space prevents full opening of OS&Y valves.

O. Seats: Renewable seats, except where otherwise indicated.

P. When soldering, use paste flux that are approved by the manufacturer for use with lead free alloys.

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Q. If valve applications are not indicated on Drawings, use the following:

1. Shutoff Service: Ball valves.

R. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

S. Valves, except wafer/butterfly types, with the following end connections:

1. For Copper Tubing, 2-inches and Smaller: Threaded ends except where solder-joint valve-end.

2. For Copper Tubing, 2-1/2-inches to NPS 4-inches: Flanged ends except where threaded valve-end.

3. For Copper Tubing: 5-inches and Larger: Flanged ends.

4. For Steel Piping, 2-inches and Smaller: Threaded ends.

5. For Steel Piping, 2-1/2-inches to NPS 4-inches: Flanged ends except where threaded valve-end.

6. For Steel Piping, 5-inches and Larger: Flanged ends.

T. Valve Adjusting and Cleaning:

1. Inspect valves for leaks. Adjust or replace packing to stop leaks. Replace valve if leak persists.

2. Valve Identification. Tag valves per Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.02 BALANCING VALVES INSTALLATION

A. See General Installation Requirements above.

B. Install with flow in the direction of the arrow on the valve body and installed at least five pipe diameters downstream from any fitting, and at least ten pipe diameters downstream from any pump. Two pipe diameters downstream from the balancing valve should be free of any fittings. When installed, easy and unobstructed access to the valve handwheel and metering ports for adjustment and measurement are to be provided. Mounting of valve in piping must prevent sediment build-up in metering ports.

3.03 BALL VALVES INSTALLATION

A. See General Installation Requirements above.

3.04 SWING CHECK VALVES INSTALLATION

A. See General Installation Requirements above.

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B. Swing Check Valve Installation: Install in horizontal position with hinge pin horizontally perpendicular to centerline of pipe. Install for proper direction of flow. Only install where there are 10 pipe diameters of straight pipe upstream of valve.

C. Ejector and Sump Pump-Discharge Check Valves:

1. 2-inches and Smaller: Bronze swing or spring-loaded lift check valves with bronze disc.

2. 2-1/2-inches and Larger: Rubber flapper swing check valves with lever and weight.

D. Domestic Water and Circulation Pump Discharge Check Valves:

1. 2-inches and Smaller: Bronze body, spring loaded, lead free, lift check.

2. 2-1/2-inches and Larger: Wafer style, silent lift check valve, lead free.

3.05 BACKFLOW PREVENTION ASSEMBLIES INSTALLATION

A. See General Installation Requirements above.

B. Install where indicated, and where required by code. Where practical, locate in same room as equipment being protected.

C. Submit product cut sheets to local AHJ for approval prior to purchase and installation.

D. Install as close to wall as possible with clearances for access and maintenance as required by AHJ.

E. Coordinate exact location of installation and type of backflow device serving a particular piece of equipment with AHJ and Architect prior to purchase and installation.

F. Provide wall/floor brackets that are of fully welded, hot dipped galvanized construction, fabricated to meet field conditions. Mount backflow preventer to brackets using cadmium plated "U" type bolts and nuts.

G. Contact local water district/backflow specialist and request backflow installation requirements. Install backflow devices per UPC and local water district/backflow specialist requirements.

H. Route waste piping from air gap waste fitting concealed within walls to point of air gap termination at indirect waste receptor.

I. Follow local codes for installation requirements. Pipe lines should be thoroughly flushed to remove foreign material before installing the unit. Provide a strainer ahead of backflow preventer to prevent disc from unnecessary fouling. Install valve in line with arrow on valve body pointing in the direction of flow. It is important that the valve be easily accessible to facilitate testing and servicing. Do not install in a concealed location.

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3.06 PRESSURE REGULATING VALVE - DOMESTIC WATER INSTALLATION

A. See General Installation Requirements above.

B. Install valve in the line with arrow on valve body pointing in the direction of flow. This valve should be installed where it is accessible with sufficient clearance for cleaning, service or adjustment. Install the reducing valve before a sill cock line if possible. Before installing the reducing valve hose bibb, flush out the line to remove loose dirt and scale which might damage valve disc and seat.

C. Horizontal installation is recommended. However, valve can be installed in a vertical position. Regulator must be installed in an accessible location to facilitate servicing the regulator.

D. To readjust reduced pressures, loosen adjusting screw nut and turn adjusting screw clockwise to raise reduced pressure and counterclockwise to lower reduced pressure.

E. When reducing valve is used, it makes a closed system; therefore, pressure relief protection must be provided on the downstream side of the reducing valve to protect equipment.

F. Provide pressure relief valve and terminate discharge to indirect waste receiver.

G. Anytime a reducing valve is adjusted, the use of a pressure gauge is recommended to verify correct pressure setting. Do not bottom out adjusting screw or spring cage.

H. Provide inlet and outlet ball valves, and globe valve bypass. Provide pressure gauge on valve outlet.

I. Provide pressure relief valve piped full size to indirect waste receiver or floor drain.

J. Provide factory startup on automatic control valves.

3.07 THERMOSTATIC MASTER MIXING VALVES (ASSE 1017 RATED) INSTALLATION

A. See General Installation Requirements above.

B. Install mixing valve per manufacturer's instruction manual.

3.08 THERMOSTATIC POINT-OF-USE MIXING VALVES (ASSE 1070 RATED) INSTALLATION

A. See General Installation Requirements above.

B. Install mixing valve per manufacturer's instruction manual.

3.09 THERMOSTATIC EMERGENCY MIXING VALVES (ASSE 1071 RATED) INSTALLATION

A. See General Installation Requirements above.

B. Install mixing valve per manufacturer's instruction manual.

END OF SECTION

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SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Pipe Hangers and Supports for Plumbing Piping and Equipment
2. Wall and Floor Sleeves
3. Building Attachments
4. Flashing
5. Miscellaneous Metal and Materials

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. ASCE 7-16, Minimum Design Loads for Buildings and Other Structures.
2. Hanger spacing installation and attachment to meet all manufacturer's requirements and MSS SP-58.
3. Terminology: As defined in MSS SP-90 "Guidelines on Terminology for Pipe Hangers and Supports."
4. Install piping per SMACNA's requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

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1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.07 PERFORMANCE REQUIREMENTS

A. General - Provide pipe and equipment hangers and supports in accordance with the following:

1. When supports, anchorages, and seismic restraints for equipment, and supports, anchorages, and seismic restraints for piping are not shown on the Drawings, the contractor is responsible for their design.

2. Connections to structural framing are not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Engineered Support Systems:

1. Support frames such as pipe racks or stanchions for piping and equipment which provide support from below.

2. Equipment and piping support frame anchorage to supporting slab or structure.

C. Provide channel support systems, for piping to support multiple pipes capable of supporting the combined weight of supported systems, system contents and test water.

D. Provide heavy-duty steel trapezes for piping to support multiple pipes capable of supporting the combined weight of supported systems, system contents and test water.

E. Provide seismic restraint hangers and supports for piping and equipment.

F. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Pipe Hangers and Supports for Plumbing Piping and Equipment:

1. Pipe Hangers/Supports:

a. B-Line Systems Inc.

b. Anvil International

c. HOLDRITE

d. Erico Co. Inc.

e. Snappitz Thermal Pipe Shield Manufacturing

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f. Rilco Manufacturing Co. Inc.

g. Nelsen-Olson Inc.

h. Or approved equivalent.

2. Channel Support Systems:

a. B-Line Systems Inc.

b. Anvil International, Anvit-Strut

c. Erico Hanger Co. Inc.; O-Strut Div.

d. Unistrut Corp.

e. HOLDRITE EZ-Strut Systems

f. Or approved equivalent.

3. Thermal-Hanger Shield Inserts:

a. Erico Hanger Co. Inc.

b. Pipe Shields, Inc.

c. Rilco Manufacturing Co. Inc.

d. HOLDRITE Insulation Couplings

e. Or approved equivalent.

4. Freestanding Roof Supports:

a. Miro

b. Nelson-Olsen Inc. / Quick "Pipe" Block

c. Eaton / B-Line / Dura-Blok

d. Mifab

e. Or approved equivalent.

5. Pipe Alignment and Secondary Supports:

a. HOLDRITE

b. Starquick

c. Or approved equivalent.

6. Tank Seismic Restraint System:

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a. HOLDRITE

b. Spacemaker

7. Wall Mounted Tank Platform:

a. HOLDRITE

b. Spacemaker

c. Or approved equivalent.

8. Floor Mount Platform:

a. HOLDRITE

b. Spacemaker

c. Or approved equivalent.

B. Wall and Floor Sleeves:

1. Below Grade and High Water Table Areas:

a. Modular Link Sealing System at Pipe Sleeves:

1) Thunderline Corporation

2) Or approved equivalent.

2. Pre-Engineered Firestop Pipe Penetration Systems:

a. HOLDRITE HydroFlame

b. Proset

c. Or approved equivalent.

C. Building Attachments:

1. Anchor-It

2. Gunnebo Fastening Corp.

3. ITW Ramset / Red Head

4. Masterset Fastening Systems, Inc.

5. Or approved equivalent.

D. Flashing:

1. Fastenal

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2. Or approved equivalent.

E. Miscellaneous Metal and Materials:

1. See Miscellaneous Metal and Materials article below.

2. Powder-Actuated Fastener Systems:

a. Gunnebo Fastening Corp.

b. Hilti, Inc.

c. ITW Ramset / Red Head

d. Masterset Fastening Systems, Inc.

e. Or approved equivalent.

2.02 PIPE HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

A. Horizontal Piping Hangers and Supports - Horizontal and Vertical Piping, and Hanger Rod Attachments:

1. Factory fabricated horizontal piping hangers and supports to suit piping systems in accordance manufacturer's published product information.

2. Use only one type by one manufacturer for each piping service.

3. Select size of hangers and supports to exactly fit pipe size for bare piping and to exactly fit around piping insulation with saddle or shield for insulated piping.

4. Provide copper-plated hangers and supports for uninsulated copper piping systems.

5. Provide padded pipe hangers, clamps and supports for thermoplastic piping system.

6. Install no hub cast iron pipe and fittings per CISPI 301-09 Installation Procedures for Hubless Cast Iron Pipe and Fittings for Sanitary and Storm Drain Waste and Vent Piping Applications. Brace hubless cast iron pipe and fittings 5-inch and larger with HOLDRITE No Hub Pipe Restraints or approved equivalent.

B. Pipe Hangers, Guides and Channel Systems:

1. Hanger Rods: Hanger rods continuously threaded or threaded ends only in concealed spaces and threaded ends only in exposed spaces; finish electro-galvanized or cadmium-plated in concealed spaces and prime painted in exposed spaces; sizes per MSS.

2. Hanger Rod Couplings: Malleable iron rod coupling with elongated center sight gap for visual inspection; to have same finish as hanger rods.

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3. Pipe Rings for Hanger Rods: Pipe sizes 2-inch and smaller, MSS SP Type 6 or Type 10, or approved equivalent. Pipe sizes 2-1/2-inches and larger, clevis type hangers with adjustable nuts on rod. MSS SP Type 1. Pipe rings to have same finish as hanger rods.

4. Pipe Slides: Type 35 reinforced Teflon slide material (3/32-inch minimum thickness) bonded to steel; highly finished steel or stainless steel contact surfaces to resists corrosion; 60-80 PSI maximum active contact surface loading; steel parts 3/16-inch minimum thickness; attachment to pipe and framing by welding.

5. Channel Type Pipe Hanging System: Framing members No. 12 gauge formed steel channels, 1-5/8-inch square, conforming to ASTM A1011 GR33; one side of channel to have a continuous slot with in-turned lips; framing nut with grooves and spring 1/2-inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A307; fittings conforming to ASTM A575; parts enamel painted or electro-galvanized.

C. Pipe Saddles and Shields:

1. Factory fabricated saddles or shields under piping hangers and supports for insulated piping.

2. Size saddles and shields for exact fit to mate with pipe insulation. 1/2 round, 18 gauge, minimum 12-inches in length (4-inch pipe and larger to be three times longer than pipe diameter).

D. Thermal-Hanger Shield Inserts: 100-PSI (690-kPa) minimum compressive strength insulation, encased in sheet metal shield.

1. Material for Cold Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with vapor barrier.

2. Material for Hot Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate.

3. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.

4. For Clevis or Band Hanger: Insert and shield to cover lower 180 degrees of pipe.

5. Insert Length: Extend 2-inches beyond sheet metal shield for piping operating below ambient air temperature.

6. Thermal Hanger Shield Inserts should be provided at the hanger points and guide locations on pipes requiring insulation. The Inserts should consist of Polyisocyanurate (urethane or phenolic insulation) encircling the entire circumference of the pipe with a 360 degree PVC (1.524 mm thick) with a living hinge and J lock and installed during the installation of the piping system.

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E. Roller Hangers:

1. Adjustable roller hanger. Black steel yoke, cast iron roller. MSS Type 41.

F. Concrete Inserts:

1. Malleable iron body, hot dipped galvanized finish. Lateral adjustment. MSS Type 18.

G. Continuous Concrete Insert:

1. Steel construction, minimum 12 gauge. Electrogalvanized finish. Pipe clamps and insert nuts to match.

H. Beam Clamps:

1. MSS Type 19 and 23, wide throat, with retaining clip.

2. Universal Side Beam Clamp: MSS Type 20.

I. Below Ground:

1. Pipe Hangers: Adjustable Clevis type, Federal Specification WW-H-171 (Type 1), UL listed, stainless steel Type 316. MSS Type 1. If PVC piping to be used, provide Type 1 hanger, coated for PVC piping.

2. Rod: 5/8-inch stainless steel Type 316.

3. Eyebolt: Stainless steel Type 316.

4. Nuts and Washers: Stainless steel Type 316.

J. Hangers for Pipe Size 2-inches and Smaller:

1. Adjustable swivel ring hanger, UL listed, Type 6 or Type 10.

K. Hangers for Pipe Size 2-1/2-inches and Larger:

1. Adjustable clevis type, UL listed, Type 1.

L. Riser Clamps:

1. Steel, UL listed. MSS Type 8.

M. Plumbers Tape:

1. Not permitted as pipe hangers or pipe straps.

N. Pipe Alignment and Secondary Support Systems:

1. Secondary Pipe supports for general applications (Non-Acoustical).

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a. Supports will be manufactured in compliance with IAPMO Product Standard PS 42-96. All products provided will be listed by IAPMO for secondary pipe support.

b. Supports may be used when sound and/or vibration transfer is not a concern.

2. Secondary pipe supports for sound and vibration attenuation (Acoustical).

a. Supports will be manufactured in compliance with IAPMO Product Standard PS 42-96. All products provided will be listed by IAPMO for secondary pipe support.

b. Acoustical pipe supports will be manufactured and installed in compliance with International Organization for Standardization (ISO) 3822-1 with current amendments.

c. Supports will be used when sound and/or vibration transfer is a concern. Locations where acoustical supports will be provided and include but are not limited to partition walls between living units, tenant spaces, retail units, mechanical rooms and lobbies.

d. Support Products:

1) Support to Wall Brace and Wall Stud Penetrations: HOLDRITE #261, #262, #263, and #264, or approved equivalent.

2) Pipe Wrap for Pipe Clamps and Channel-Mounted Pipe Clamps: HOLDRITE #270, or approved equivalent.

3) Pipe Wrap for Pipe Hangers: HOLDRITE #271, #272-2, and #272-4, or approved equivalent.

4) Drop-Ear Fitting Support: HOLDRITE #265, or approved equivalent.

5) Floor Riser Isolation Pads: HOLDRITE #275-T, or approved equivalent.

6) Floor Isolation Pads (General Applications): HOLDRITE #274, #275, #276, and #278, or approved equivalent.

O. Freestanding Roof Pipe Supports:

1. Polyethylene high-density UV resistant block with foam pad or 100 percent UV resistant recycled rubber. With galvanized strut/channel.

P. Tank Seismic Restraint Systems:

1. Constructed of galvanized or stainless steel metal with steel wall attachments meeting local seismic requirements.

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2. Provide with strap tightening mechanism to ensure seismic restraint of full tank.

Q. Wall Mounted Tank Platform:

1. Constructed of galvanized or stainless steel metal with steel support brackets and wall attachments meeting local seismic requirements.

2. Provided with welded steel, threaded drain fitting.

R. Floor Mount Platform:

1. Constructed of galvanized or stainless steel metal with steel attachments meeting local seismic requirements.

2. Platforms to be rated specifically total tank system wet weight rating and size.

2.03 WALL AND FLOOR SLEEVES

A. Below Grade and High Water Table Areas:

1. Modular Link Sealing System at Pipe Sleeves: Neoprene gasket links bolted together around an interior sleeve forming a watertight seal. Use a modular link sealing system at sleeves to continuously fill the annular space between the pipe and the wall opening. Provide Link-seal Type C unless otherwise noted. OS with S-316 stainless construction for continuous water/tank walls.

2. Sleeves through concrete foundation walls and floors. Ductile iron pipe. Class 50 or 51 pipe conforming to ANSI/AWWA C151/A21.51. Pipe sleeve will extend a minimum of 6-inches beyond outside perimeter of foundation. Final placement of sleeve will be confirmed with project's structural engineer. In areas with a high water table, provide AWWA C900, Class 235 plastic pipe in lieu of ductile iron pipe.

B. Pre-Engineered Firestop Pipe Penetration Systems: UL listed assemblies for maintaining fire rating of piping penetrations through fire-rated assemblies. Comply with ASTM E814.

C. Insulating Caulking: Eagle or Pitcher Super 66 high temperature cement.

D. Fabricated Accessories:

1. Steel Pipe Sleeves: Fabricate from Schedule 40 black or galvanized steel pipe. Remove end burrs by grinding.

2. Sheet Metal Pipe Sleeves: Fabricate from G-90 galvanized sheets closed with lock-seam joints. Provide following minimum gauges for sizes indicated:

a. Sleeve Size 4-inches in Diameter and Smaller: 18 gauge.

b. Sleeve Sizes 5-inches to 6-inches: 16 gauge.

c. Sleeve Sizes 7-inches and Larger: 14 gauge.

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d. Fire-Rated Safing Material:

1) Rockwool Insulation: Complying with FS-HH-I-558, Form A, Class IV, 6 lbs./cu.ft. density with melting point of 1985 degrees F and K value of 0.24 at 75 degrees F.

2) Calcium Silicate Insulation: Noncombustible, complying with FS-HH-I-523, Type II, suitable for 100 degrees F to 1200 degrees F service with K value of 0.40 at 150 degrees F.

2.04 BUILDING ATTACHMENTS

A. General: Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project Structural Engineer. Provide anchor bolts suitable for cracked concrete.

B. Anchor Bolts:

1. Anchor Bolts (Cast-In-Place): Steel bolts, ASTM A307. Nuts to conform to ASTM A194. Design values for shear and tension not more than 80 percent of the allowable listed loads.

2. Anchor (Expansion) Bolts: Carbon steel to ASTM A307; nut to conform to ASTM A194; drilled-in type. Design values for shear and tension not more than 80 percent of the allowable listed loads.

3. Anchor (Adhesive) Bolts: Consisting of two-part adhesive cartridge and zinc-plated Type A307 steel anchor bolt rod assembly with ASTM A194 nut.

C. Beam Clamps:

1. MSS Type 19 and 23, wide throat, with retaining clip.

2. Universal Side Beam Clamp: MSS Type 20.

D. Powder-Actuated Drive Pin Fasteners:

1. Powder-Actuated Drive-Pin Fasteners: Powder actuated type, drive pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

E. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

F. Grout: ASTM C1107, Grade B, factory mixed and packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.

1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.

2. Properties: Non-staining, noncorrosive, and non-gaseous.

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3. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

2.05 FLASHING

A. Steel Flashing: 26 gauge galvanized steel.

B. Safes: 8 mil thick neoprene.

C. Caps: Steel, 22 gauge minimum, 16 gauge at fire-resistant structures.

D. Provide hot dipped galvanized components for items exposed to weather.

2.06 MISCELLANEOUS METAL AND MATERIALS

A. Miscellaneous Metal: Provide miscellaneous metal items specified hereunder, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on Drawings or otherwise not shown on drawings, that are necessary for completion of the project. The Contractor is responsible for their design.

1. Fabricate miscellaneous units to size, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

B. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.

C. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.

D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.

E. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.

F. Miscellaneous Materials: Provide incidental accessory materials, tools, methods and equipment required for fabrication.

G. Provide hot dipped galvanized components for items exposed to weather.

H. Use straps, threshold rods and wire with sizes required by SMACNA to support piping.

I. Grout: ASTM C1107, Grade B, factory mixed and packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.

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1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.

2. Properties: Non-staining, noncorrosive, and non-gaseous.

3. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Examination:

1. Verify building materials to have hangers and attachments affixed in accordance with hangers to be used. Provide supporting calculations.

B. Preparation:

1. Examine Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall," "2-Hour Fire/Smoke Barrier," and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.

C. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate with project structural engineer proper placement of inserts, anchors and other building structural attachments.

3.02 PIPE HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

A. Hangers and Supports:

1. Comply with MSS SP-58. Pipe Hanger and Support Installation: Install hangers, supports, clamps, and attachments as required to properly support piping from building structure. For horizontally hung grooved-end piping, provide a minimum of 2 hangers per pipe section.

2. Pipe Ring Diameters:

a. Uninsulated and Insulated Pipe, except where oversized pipe rings are specified: Ring inner diameter to suit pipe outer diameter.

b. Insulated Piping Where Oversized Pipe Rings are Specified and Vibration Isolating Sleeves: Ring inner diameter to suit outer diameter of insulation or sleeve.

3. Oversize Pipe Rings: Provide oversize pipe rings of 2-inch and larger size.

4. Pipe Support Brackets: Support pipe with pipe slides.

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5. Steel Backing in Walls: Provide steel backing in walls to support fixtures and piping hung from steel stud walls.

6. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

    a. Field assemble and install according to manufacturer's written instructions.

7. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field -fabricated, heavy-duty trapezes.

    a. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

    b. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1

8. Group parallel runs of horizontal piping to be supported together on trapeze-type hangers.

9. 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.

10. Do not support piping from other piping.

11. Fire protection piping will be supported independently of other piping.

12. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.

13. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

14. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchor, and to facilitate the action of expansion joints, expansion loops, expansion bends and similar units.

15. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

16. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping" is not exceeded.

17. Insulated Piping (comply with the following):

    a. Attach clamps and spacers to piping.

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1) Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

2) Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

3) Do not exceed pipe stress limits according to ASME B31.9.

b. Install MSS SP-58, Type 39 protection saddles, if insulation without a vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

1) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.

c. Install MSS SP-58, Type 40 protective shields on cold piping having a vapor barrier. Shields to span arc of 180 degrees.

1) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.

d. Shield Dimensions for Pipe, not less than the following:

1) NPS 1/4 to NPS 3-1/2 (DN8 to DN 90): 12-inches long and 0.048-inch thick.

2) NPS 4 (DN100): 12-inches long and 0.06-inch thick.

3) NPS 5 and NPS 6 (DN125 and DN150): 18-inches long and 0.06-inch thick.

4) NPS 8 to NPS 14 (DN200 to DN350): 24-inches long and 0.075-inch thick.

5) NPS 16 to NPS 24 (DN400 to DN600): 24-inches long and 0.105-inch thick.

e. Pipes NPS 8 (DN200) and Larger: Include wood inserts.

f. Insert Material: Length at least as long as protective shield.

g. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

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18. Equipment Clearances: Do not route equipment or piping through electrical rooms, transformer vaults, elevator equipment rooms, IT rooms, MPOE rooms, or other electrical or electronic equipment spaces and enclosures and the like. Within equipment rooms, provide minimum 3-feet lateral clearance from all sides of electric switchgear panels. Do not route piping or equipment above any electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact equipment or pipe routing to provide proper clearance with such items.

19. Pipe supports and hanger spacing (pipe supported from structure or floor-supported) to meet the requirements of References and Standards Article in Part 1 above.

B. Pipe Curb Assemblies:

1. Provide for piping which penetrates the structural roof deck to service equipment above the roof level (e.g., piping, electrical power and control wiring). Meet requirements of roof warranty.

2. Provide prefabricated units for roof membrane and insulation penetrations related to equipment. Coordinate with roofing system. Set supports on the structural deck. Do not set supports on insulation or roofing. Provide level supports by prefabricated pitch built into the curb.

3. Piping above roof to be supported with freestanding roof pipe supports unless detailed otherwise. At roofing applications, the adhesion mastic is to be specifically submitted to and approved by the roofing system manufacturer/installer to maintain the integrity of all warranties.

4. At concrete floors, install a polyurethane mastic to the support block and adhere in place.

C. Vertical Piping:

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

2. Riser clamps to be directly under fitting or welded to pipe. Provide neoprene pads for all systems except natural gas.

3. Riser to be supported at each floor penetration.

4. Provide structural steel supports at the base of pipe risers. Size supports to carry forces exerted by piping system when in operation.

D. Adjusting and Painting:

1. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping and equipment to proper level and elevations.

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2. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.

E. Tank Seismic Restraint Systems:

1. Install restraint system per manufacturer's instructions.

2. Coordinate system attachments to building structure with structural engineer and complete installation in accordance with engineers' requirements.

F. Wall Mounted Tank Platform:

1. Install restraint system per manufacturer's instructions.

2. Coordinate system attachments to building structure with structural engineer and complete installation in accordance with engineers' requirements.

G. Floor Mount Platform:

1. Install restraint system per manufacturer's instructions.

2. Coordinate system attachments to building structure with structural engineer and complete installation in accordance with engineers' requirements.

3.03 WALL AND FLOOR SLEEVES

A. Modular Link Sealing System Pipe Sleeves: Install at slab on grade floor/below grade piping penetrations. Provide manufacturer's sleeve appropriate to seal type for pre-cast penetrations (except for DWV piping at slab on grade). Provide manufacturer's sleeve appropriate to seal type for pre-cast penetrations.

B. Fabricated Pipe Sleeves:

1. Provide either steel or sheet metal pipe sleeves accurately centered around pipe routes. Size such that piping and insulation, if any, will have free movement within the sleeve, including allowance for thermal expansion. Sleeve diameter to be determined by local seismic clearance requirement, and by waterproofing requirements.

2. Length: Equal to thickness of construction penetrated, except extend floor sleeves 1-inch above floor finish.

3. Provide temporary support of sleeves during placement in concrete and other work around sleeves. Provide temporary end closures to prevent concrete and other materials from entering pipe sleeves.

4. Seal each end airtight with a resilient nonhardening sealer, UL listed and fire rated per ASTM 814.

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3.04 BUILDING ATTACHMENTS

A. Install within concrete slabs or attach to structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints and at changes in direction of piping.

B. Attachment to Wood Structure: Provide MSS Type 34 for attachment to wooden beam or approved attachment for a wood structure.

C. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Install concrete inserts before concrete is placed; fasten insert secure to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.

E. Install powder-actuated drive pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Test powder-actuated insert attachments with a minimum load of 100 pounds.

F. Bolting: Provide bored, drilled or reamed holes for bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.

G. Anchor Bolts:

1. Install anchor bolts for mechanical equipment and piping as required. Tightly fit and clamp base-supported equipment anchor bolts at equipment support points. Provide locknuts where equipment and piping are hung.

2. Anchor Bolts (Cast-In-Place): Embed anchor bolts in new cast-in-place concrete to anchor equipment. Install a pipe sleeve around the anchor bolt for adjustment of the top 1/3 of the bolt embedment; sizes and patterns to suit the installation conditions of the equipment to be anchored.

H. Pipe Anchors: Provide anchors to fasten piping which is subject to expansion and contraction, and adjacent to equipment to prevent loading high forces onto the equipment.

I. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor wall, and through equipment room walls and floors.

J. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:

1. Install fabricated pipe sleeve.

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2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification with specified material.

3. Seal each end airtight with a resilient nonhardening UL listed fire resistant ASTM 814 sealant.

K. Piping Penetrations Through Fire-Rated (1 to 3 hour) Assemblies:

1. Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.

2. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814. Use HOLDRITE HydroFlame or approved equivalent.

L. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

3.05 FLASHING

A. Flash and counter flash where piping passes through weather or waterproofed walls, floors and roofs.

B. Flash vent soil pipes with flashings per Division 01, General Requirements.

C. Flash floor drains over finished areas and roof drains, 10-inches clear on sides, minimum 36-inches by 36-inches sheet size. See Division 01, General Requirements. Fasten flashing to drain with clamping device.

D. Install built up fixtures (mop sinks, shower stalls, shower floors) with water sealing systems/membranes to meet Code and as prescribed by Division 01, General Requirements and Section 22 00 00, Plumbing Basic Requirements. Meet all Code testing requirements. Provide drainage devices with appropriate flanges, clamps, etc. to meet these installation requirements and ensure a water-tight installation.

3.06 MISCELLANEOUS METAL AND MATERIALS

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required. Avoid cutting concrete reinforcing when drilling for inserts. Reference structural drawings and reinforcing shop drawings and determine locations of stirrups prior to drilling into concrete.

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C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

E. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

1. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

F. Fabrication:

1. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on Drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates and similar devices. Hot dip galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.

2. Finishes:

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a. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with 1 coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas with primer of same material before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.

b. Metal in contact with Concrete, Masonry and Other Dissimilar Materials:

1) Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.

c. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

G. Metal Fabrication:

1. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

2. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

3. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of weld and methods used in correcting welding work, and with the following:

a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

b. Obtain fusion without undercut or overlap.

c. Remove welding flux immediately.

d. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

4. Provide hot dipped galvanized components for items exposed to weather.

END OF SECTION

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SECTION 22 05 48
VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Vibration Isolation

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

2. Section 22 30 00 - Plumbing Equipment

1.03 REFERENCES AND STANDARDS

A. References and standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Vibration Isolation:

a. Product Data: Provide catalog data indicating size, type, load and deflection of each isolator; and percent of vibration transmitted based on lowest disturbing frequency of equipment.

b. 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.

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7) Code number assigned to each isolator.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Vibration Isolation:

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

b. Deflections indicated will be minimum actual static deflections for specific equipment supported.

c. Isolator Stability:

1) Size springs of sufficient diameter to maintain stability of equipment being supported with minimum horizontal to vertical stiffness ratio not less than 1:1. Spring diameters will be not less than 0.8 of the compressed height at rated load.

2) Springs will have minimum additional travel to solid equal to 50 percent of the rated defection.

3) Springs will support 200 percent of rated load when fully compressed without deformation or failure.

d. Maximum Allowable Vibration Levels: Peak vibration velocities not to exceed 0.08 in/sec. correct equipment operating at vibration velocities that exceed this criteria.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Vibration Isolation:

1. Amber-Booth.

2. California Dynamics Corporation.

3. Mason Industries, Inc.

4. Kinetics Noise Control.

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5. Vibro-Acoustics.

6. Where Mason numbers are specified, equivalent products by listed manufacturers are acceptable.

7. Or approved equivalent.

2.02 VIBRATION ISOLATION

A. Type 1 - Neoprene Pad: Rubber or neoprene waffle pads, single layer, 5/16-inch thick with pattern repeating on 1/2-inch centers; 40 to 50 durometer hardness; maximum loading 50 PSI, 1/4-inch thick steel load distribution plate. Mason Type SWM.

B. Type 2 - Neoprene Mount: Double-deflection type, with steel or ductile-iron housing containing two separate and opposing, oil-resistant rubber or neoprene elements, factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Minimum static deflection of 0.20-inches. Mason Type BR.

C. Type 3 - Spring: Freestanding, laterally stable, open-spring isolators, factory drilled for bolting to structure, if needed, and bonded to 1/4-inch thick rubber isolator pad attached to baseplate underside, mounts with leveling bolts. Mason Type SLFH or Type SLF.

D. Type 4 - Spring with Restraints: Laterally stable, open-spring isolators, factory drilled for bolting to structure and bonded to 1/4-inch thick rubber isolator pad attached to baseplate underside; mounts with leveling bolts; steel or cast iron housing for directional seismic snubbing with resilient vertical-limit stops. Mason Type SLR or SSLFH.

E. Type 5 - Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression; designed for 30-degree angular movement before hanger-rod misalignment without binding; seismic rebound washer; 1-inch minimum deflection. Mason Type PC30N.

F. Seismic Snubbers: Directional interlocking steel members restrained by one-piece molded neoprene bushing, minimum of 3/4-inch thick with minimum 1/8-inch air gap in all directions, capable of withstanding 3 times the rated load capacity. Mason Type Z-1225.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Vibration isolators and seismic restraint systems must be installed in strict accordance with manufacturers written instructions and certified submittal data.

2. Set floor-mounted equipment on minimum 4-inch-high concrete housekeeping pads. Extend pad at least 6-inches beyond footprint of equipment in each direction.

3. Provide mounts for equipment installed outdoors for wind loads of 30-pounds psf applied to any exposed surface of isolated equipment.

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4. Do not install equipment or pipe which makes rigid contact with building slabs, beams, studs, walls, etc.

5. Anchor baseplate to floor or structure. Provide rubber grommets and washers to isolate bolt from base plate. Under no circumstances will isolation efficiency be destroyed when bolting the isolators to floor.

6. Building Penetrations: Isolate water piping penetrating wall, ceilings, floors or shafts from the structure by piping isolator or by 3/8-inch thick foamed rubber insulation. Install units flush with finished structure face, using one for each side as required. Cut units to length if longer than structure thickness. Caulk around pipe at equipment room wall.

7. Pipe Hangers in Equipment Rooms: Support water and gas piping connected to rotating equipment within equipment rooms on spring and neoprene hangers. The first three hangers from a piece of vibrating equipment are to have a minimum of 1/2 static deflection of equipment isolators. Other isolators should have a minimum of 1/4 static deflection of equipment isolators.

3.02 VIBRATION ISOLATION EQUIPMENT INSTALLATION

A. Install isolation as indicated on Drawings by type and location and where indicated below.

B. Isolation Mounts:

1. Position vibration isolation hanger elements as high as possible in hanger rod assembly but not in contact with building structure. Install hangers so that hanger housing may rotate full 360 degrees about rod axis without contacting any object.

2. Where parallel running pipes are hung together on a trapeze which is isolated from the building, provide isolator deflections for largest determined by provisions for pipe isolation. Do not mix isolated and non-isolated pipes in the same trapeze.

3. Install Type 3 and 4 isolators such that installed and operating heights of vibration isolated equipment is identical. Install limit stops so that they are out of contact during normal operation.

4. Adjust leveling bolts and hanger rod bolts so isolated equipment is level and in proper alignment with connecting pipes.

C. Isolating Pipe Hangers:

1. Install on compressed air and water piping connected to rotating equipment in the mechanical rooms. Provide isolating hanger supports for each piece of isolated equipment outside of mechanical rooms and where indicated.

2. Isolated equipment items include base mounted pumps and line mounted pumps.

D. Pump Inertia Bases:

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1. Fill with concrete to provide base weight equal to 2 times combined pump, motor, pipe, and water weight.

2. Provide a minimum operating clearance of 1-inch between structural steel frames and concrete housekeeping pads or floor beneath equipment.

3. Support heels of suction and discharge elbows from base.

4. Secure pump and heel supports with inserts and grout.

E. Other Inertia Bases: Unless otherwise indicated, provide a minimum operating clearance of 1-inch between structural steel frames and the concrete housekeeping pad or floor beneath equipment. Position isolator mounting brackets so that the required clearance is maintained.

F. Vibration isolators must not cause change of position of equipment or piping which would stress piping connections or misalign shafts or bearings.

G. Vibration isolators and seismic restraint systems must be installed in strict accordance with manufacturers written instructions and certified submittal data.

H. Anchor baseplate to floor or structure. Provide rubber grommets and washers to isolate bolt from base plate. Under no circumstances will isolation efficiency be destroyed when bolting the isolators to floor.

I. Anchorage: Adequately anchor or brace plumbing equipment and piping to resist displacement due to seismic action, include snubbers on equipment mounted on spring isolators, pumps and the like.

END OF SECTION

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SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Plastic Nameplates
2. Tags
3. Plastic Pipe Markers

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, submit Valve Schedule for each piping system, in tabular format using Microsoft Word or Excel software. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shutoff and similar special uses by special "flags" in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals. Provide schedules organized as follows:

1. Equipment Type:
    a. Identification:
    b. Background:
        1) Size:
        2) Color:
    c. Lettering:
        1) Size:
        2) Color:

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1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.

2. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22, Plumbing Sections. Where more than a single type is specified for application, provide single selection for each product category.

B. Plastic Nameplates:

1. Brady Corporation

2. Or approved equivalent.

C. Tags:

1. Brady Corporation

2. Brimar

3. Champion America Inc.

4. Craftmark

5. Seton Identification Products

6. Or approved equivalent.

D. Plastic Pipe Markers:

1. Brady Corporation

2. Brimar

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3. Champion America Inc.

4. Craftmark

5. Seton Identification Products

6. Or approved equivalent.

2.02 PLASTIC NAMEPLATES

A. Description: Engraving stock melamine plastic laminate 1/8-inch thick, engraved with engraver's standard letter style of the sizes and wording indicated.

1. Letter Color: White.

2. Letter Height: 1/2 inch.

3. Background Color: Black.

4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

5. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or devices/equipment. Include center hole to allow attachment.

6. Signage for hot water outlets on 140 degree F hot water systems not protected by ASSE 1070 mixing valves; hose bibbs, janitor sinks, and fixtures used by trained personnel.

a. Manufacturer's standard 1/8-inch thick engraved plastic laminate signage 4 by 4-inches.

b. Letter Color: Red.

c. Letter Height: 1/2 inch.

d. Background Color: White.

e. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch diameter.

B. Metal Tags: Polished Brass with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.

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C. Valve designations to be coordinated with existing valve identifications to ensure no repetitive designations are utilized.

D. Chart/Schedules: Valve Schedule Frames. For each page of a valve schedule, provide glazed display frame with removable mounting as appropriate for wall construction upon which frame is to be mounted. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

E. Valve Tag Fasteners: Solid brass chain (wire link or beaded type), or solid brass S-hooks.

F. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4- by 7-inches.

2. Fasteners: Brass grommet and wire.

3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

4. Color: Yellow background with black lettering.

2.04 PLASTIC PIPE MARKERS

A. Color: Conform to ASME A13.1 and ANSI Z535.1.

B. Plastic Pipe Markers (for external diameters of 6-inches and larger including insulation): Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers (for external diameters less than 6-inches including insulation): Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Lettering and Graphics:

1. General: Coordinate names, abbreviations and other designations used in plumbing identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

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2. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Chiller No. 3, Air Handling Unit No. 42, Standpipe F12, and the like).

B. Preparation: Degrease and clean surfaces to receive adhesive for identification materials.

C. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

D. Install valve schedule at each mechanical room.

E. Access Doors: Provide markers on each access door and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions.

3.02 PLASTIC NAMEPLATES

A. Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates riveted to equipment body.

B. Identify control panels and major control components outside panels with plastic nameplates riveted to equipment body.

C. Install plastic nameplates with corrosive-resistant mechanical fasteners.

3.03 TAGS

A. Small devices, such as in-line pumps, may be identified with tags. Use metal tags on piping 3/4-inch diameter and smaller.

B. Identify valves in main and branch piping with metal tags. Indicate valve function and the normally open or closed positions on the valve tag.

C. Coordinate with the facility maintenance personnel to ensure consistency with the existing tagging system.

D. Tag balancing valves with balanced GPM or CFM indicated after balancing is completed and accepted.

E. Install tags with corrosion resistant chain.

3.04 PLASTIC PIPE MARKERS

A. Install plastic pipe markers in accordance with manufacturer's instructions.

B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

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C. For exterior underground piping installations, install underground plastic pipe markers with tracer wire 6- to 8-inches below finished grade directly above buried pipe.

D. Identify piping, concealed or exposed, with plastic tape pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20-feet (reduced to 10-feet in congested areas and mechanical equipment rooms) on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction. Locate near branches, valves, control devices, equipment connections, access doors, floor/wall penetrations.

END OF SECTION

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SECTION 22 05 93
TESTING, ADJUSTING, AND BALANCING FOR PLUMBING

PART 1 - GENERAL

1.01 SUMMARY

A. Balancing water flow within distribution systems of all Division 22, Plumbing Sections, including sub-mains, branches, and terminals, to indicated quantities according to specified tolerances.

B. Adjusting plumbing systems to provide indicated quantities.

C. Verifying that automatic control devices are functioning properly.

D. Reporting results of the activities and procedures specified in this Section.

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Acceptable Balance Firm:

a. General:

1) Procure services of independent Testing, Adjusting, and Balancing (TAB) agency to balance, adjust and test water circulating. Minimum Experience: 5 years.

b. Industry Standards: Testing and Balancing will conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), and American National Standards Institute (ANSI) as follows:

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1) NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.

2) ASHRAE: Comply with recommendations pertaining to measurements, instruments, and TAB.

c. Test Observation: If requested, conduct tests in the presence of the Architect or the Architect's representative.

2. Provide proof of testing agency having successfully completed at least five projects of similar size and scope.

3. Code Compliance: Perform tests in the presence of the Authority Having Jurisdiction (AHJ) where required by the Authority Having Jurisdiction (AHJ).

4. Owner Witness: Perform tests in the presence of the Owner's representative.

5. Engineer Witness: The engineer or engineer's representative reserves the right to observe tests or selected tests to assure compliance with the specifications.

6. Simultaneous Testing: Test observations by the Authority Having Jurisdiction (AHJ), the Owner's Authorized Representative and the engineer's representative need not occur simultaneously.

7. Do not perform TAB work until plumbing equipment has been completely installed and is operating continuously as required.

8. Conduct TAB with clean filters in place. Clean strainers prior to performing TAB.

9. Agent Qualifications: Engage a TAB Agent certified by AABC or NEBB.

10. TAB Conference: Meet with the Owner's and the Architect's representatives on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, controls Installer, and other support personnel. Provide 7 days advance notice of scheduled meeting time and location.

a. Agenda Items: Include at least the following:

1) Submittal distribution requirements.

2) TAB plan.

3) Work schedule and Project site access requirements.

4) Coordination and cooperation of trades and subcontractors.

5) Coordination of documentation and communication flow.

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11. Certification of TAB Reports: Certify the TAB field data reports. This certification includes the following:

    a. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

    b. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

12. TAB Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."

13. TAB Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

14. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.

15. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

16. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.07 DEFINITIONS

A. Adjust: To regulate fluid flow rate at the equipment.

B. Balance: To proportion flows within the distribution system, including sub mains, branches, and terminals, according to design quantities.

C. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

D. Report Forms: Test data sheets for recording test data in logical order.

E. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

F. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

G. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

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H. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

I. TAB: Testing, Adjusting, and Balancing.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing (TAB) Agent: The entity responsible for performing and reporting the TAB procedures.

M. AABC: Associated Air Balance Council.

N. AMCA: Air Movement and Control Association.

O. CTI: Cooling Tower Institute.

P. NEBB: National Environmental Balancing Bureau.

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

1.08 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, controls installers, and other mechanics to operate systems and equipment to support and assist TAB activities.

B. Notice: Provide 7 days advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on piping distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PROJECT CONDITIONS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire TAB period. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.

B. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.

C. Non-Owner Occupancy: Complete balancing of building systems prior to Substantial Completion and owner occupancy.

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3.02 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and existing building record documents (if available) to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

2. Verify that balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of plumbing systems and equipment.

C. Examine equipment performance data including pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

E. Examine system and equipment installations to verify that indicated balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

G. Examine open-piping-system pumps to ensure absence of entrained air in the suction piping.

H. Examine equipment for installation and for properly operating safety interlocks and controls.

I. Examine automatic temperature system components to verify the following:

1. Valves, and other controlled devices operate by the intended controller.

2. Valves are in the position indicated by the controller.

3. Integrity of valves for free and full operation and for tightness of fully closed and fully open positions.

4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.

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5. Sensors are located to sense only the intended conditions.

6. Sequence of operation for control modes is according to the Contract Documents.

7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

J. Report deficiencies discovered before and during performance of TAB procedures.

K. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Systems are filled, clean, and free of air.

3. Automatic temperature-control systems are operational.

4. Isolating and balancing valves are open and control valves are operational.

C. Hold a pre-balancing meeting at least one week prior to starting TAB work.

1. Attendance is required by installers whose work will be tested, adjusted, or balanced.

D. Provide instruments required for TAB operations. Make instruments available to Architect to facilitate spot checks during testing.

3.04 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform TAB procedures on each system according to the procedures contained in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation for pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including control positions, valve indicators and similar controls and devices, to show final settings.

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3.05 ADJUSTMENT TOLERANCES

A. Piping Systems: Adjust to within plus or minus 10 percent of Design.

3.06 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.

2. Discrepancies, deficient or uncompleted work by others.

3. Contract interpretation requests.

4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings locations where other critical measurements were taken and cross reference location in final report.

3.07 FUNDAMENTAL PROCEDURES FOR PIPING SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 10 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare systems for TAB according to the following, in addition to the general preparation procedures specified above:

1. Open manual valves for maximum flow.

2. Check expansion tank liquid level, or air charge if bladder type.

3. Check makeup-water-station pressure gauge for adequate pressure.

4. Check flow-control valves for specified sequence of operation and set at design flow.

5. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.

3.08 FINAL REPORT

A. General: Computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into Sections by tested and balanced systems.

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B. Include a certification sheet in front of binder signed and sealed by the certified TAB engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Pump curves.

2. Field test reports prepared by system and equipment installers.

3. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.

2. Name and address of TAB Agent.

3. Project name.

4. Project location.

5. Architect's name and address.

6. Engineer's name and address.

7. Contractor's name and address.

8. Report date.

9. Signature of TAB Agent who certifies the report.

10. Summary of contents, including the following:

a. Design versus final performance.

b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.

12. Notes to explain why certain final data in the body of reports vary from design values.

E. Pump Test Reports: For pumps, include the following data. Calculate impeller size by plotting the shutoff head on pump curves.

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1. Unit Data: Include the following:
   a. Unit identification.
   b. Location.
   c. Service.
   d. Make and size.
   e. Model and serial numbers.
   f. Water flow rate in gpm (L/s).
   g. Water pressure differential in feet of head or PSIG (kPa).
   h. Required net positive suction head in feet of head or PSIG (kPa).
   i. Pump rpm.
   j. Impeller diameter in inches.
   k. Motor make and frame size.
   l. Motor horsepower and rpm.
   m. Voltage at each connection.

END OF SECTION

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SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Type 1, Glass Wool Pipe Insulation
2. Type 2, Flexible Elastomeric Insulation
3. Type 5, Glass Wool Equipment Insulation
4. Type 7, ADA Accessible Lavatory/Sink Insulation Kit
5. Accessories
6. Pipe Fitting Insulation Covers

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Piping insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Installer qualifications.
2. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any) for each type of product indicated.
3. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

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4. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

5. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements apply to this Section.

B. In addition, meet the following:

1. Formaldehyde Free: Should be third-party certified with UL Environment Validation.

2. Recycled Content: A minimum of 40 percent post-consumer recycled glass content certified and UL validated.

3. Low Emitting Materials: For all thermal and acoustical applications of Glass Mineral Wool Insulation products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.

4. Installer to have minimum 5 years' experience in the business of installing insulation.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.07 FIRE HAZARD CLASSIFICATION

A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a Flame Spread Index (FSI) of 25 and Smoke Developed Index (SDI) of 50 as tested by current edition of ASTM E84 (NFPA 255) method.

B. Test pipe insulation in accordance with requirements of current edition of UL "Pipe and Equipment Coverings."

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Type 1, Glass Wool Pipe Insulation:

1. Johns Manville

2. Knauf

3. Owens-Corning

4. Or approved equivalent.

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B. Type 2, Flexible Elastomeric Insulation:

1. Insulation:

a. Armacell LLC Armaflex

b. K-Flex

c. Or approved equivalent.

2. Glue:

a. Armacell LLC Armaflex Low VOC Adhesive

b. K-Flex

c. Or approved equivalent.

3. Paint:

a. Armacell LLC Armaflex

b. K-Flex

c. Or approved equivalent.

C. Type 5, Glass Wool Equipment Insulation:

1. Knauf

2. Owens-Corning

3. Johns Manville

4. Or approved equivalent.

D. Type 7, ADA Accessible Lavatory/Sink Insulation Kit:

1. IPS/Truebro

2. McGuire/Pro-Wrap

3. Plumberex/Pro-Extreme

4. Brocar Trap Wrap

5. Or approved equivalent.

E. Accessories:

1. ITW Insulation Systems

2. Or approved equivalent.

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F. Pipe Fitting Insulation Covers:

1. Zeston Johns Manville
2. ITW Insulation Systems
3. Or approved equivalent.

2.02 TYPE 1, GLASS WOOL PIPE INSULATION

A. Glass Fiber: ASTM C547 Type I and IV; rigid molded, noncombustible.

1. Thermal Conductivity Value: 0.27 BTU*in/(hr*sf*F) at 75 degrees F.
2. Maximum Service Temperature: 850 degrees F to 1000 degrees F.
3. Vapor Retarder Jacket: White Kraft paper reinforced with glass fiber and bonded to aluminum foil, with self-sealing longitudinal laps and butt strips or vapor barrier mastic.

2.03 TYPE 2, FLEXIBLE ELASTOMERIC INSULATION

A. Elastomeric Foam: ASTM C534; flexible, cellular elastomeric, molded or sheet.

1. Thermal Conductivity Value: 0.25 BTU*in/(hr*sf*F) at 75 degrees F.
2. Maximum Service Temperature of 220 degrees F.
3. Maximum Flame Spread: 25.
4. Maximum Smoke Developed: 50 (3/4-inch thick and below).
5. Connection: Waterproof vapor retarder adhesive as needed.
6. UV Protection: UV outdoor protective coating per manufacturer's requirements.

B. Glue: Contact adhesive specifically manufactured for cementing flexible elastomeric foam.

C. Paint: Nonhardening high elasticity type, specifically manufactured as a protective covering of flexible elastomeric foam insulation for prevention of degradation due to exposure to sunlight and weather.

2.04 TYPE 5, GLASS WOOL EQUIPMENT INSULATION

A. Flexible Glass Wool Blanket: ASTM C612; flexible.

1. Thermal Conductivity Value: 0.24 BTU*in/(hr*sf*F) at 75 degrees F.
2. Maximum Service Temperature: 450 degrees F.

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2.05 TYPE 7, ADA ACCESSIBLE LAVATORY/SINK INSULATION KIT

A. P-traps, trap arms, tail pieces, hot water and cold water insulating guards meeting ASTM C1822. Molded closed cell insulation with vinyl cover and nylon fasteners, paintable. Provide accessories as required for complete installation covering all exposed waste piping, water piping, stops and supplies. Color white.

2.06 ACCESSORIES

A. Equipment Insulation Compounds: Provide adhesives, cement, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

B. Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated. Accessories, i.e., adhesives, mastics, cements and tape to have same flame and smoke component ratings as insulation materials with which they are used. Shipping cartons to bear a label indicating that flame and smoke ratings do not exceed those listed above. Provide permanent treatment of jackets or facings to impart flame and smoke safety. Provide non-water soluble treatments. Provide UV protection recommended by manufacturer for outdoor installation.

2.07 PIPE FITTING INSULATION COVERS

A. PVC Plastic Fitting Covers: Schuller Zeston 2000, Knauf Proto Fitting or approved equivalent. One-piece molded type fitting covers and jacketing material, gloss white. Connections: Tacks; pressure sensitive color matching vinyl tape.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION INFORMATION

A. Verification of Conditions:

1. Do not apply insulation until pressure testing and inspection of piping has been completed.

2. Examine areas and conditions under which insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Preparation: Clean and dry surfaces to be insulated.

C. Installation:

1. Insulation: Continuous through walls, floors, and partitions except where noted otherwise.

2. Piping and Equipment:

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a. Install insulation over clean, dry surfaces with adjoining sections firmly butted together and covering surfaces. Fill voids and holes. Seal raw edges. Install insulation in a manner such that insulation may be split, removed, and reinstalled with vapor barrier tape on strainer caps and unions. Do not install insulation until piping has been leak tested and has passed such tests. Do not insulate manholes, equipment manufacturer's nameplates, handholes, and ASME stamps. Provide beveled edge at such insulation interruptions. Repair voids or tears.

D. Provide accessories as required. See Part 2 Article "Accessories" above.

E. Protection and Replacement: Protect installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

F. Labeling and Marking: Provide labels, arrows and color coding on piping. Attach labels and flow direction arrows to jacketing per Section 22 05 53, Identification for Plumbing Piping and Equipment.

G. Insulation Shields: Provide hangers and shields (18 gauge minimum) outside of insulation for cold piping (<60 degrees F). Hot water piping hangers may penetrate insulation to contact pipe directly. Provide 18-inch long, noncompressible insulation section at insulation shields for lines 1-1/2-inches and larger (hot and cold piping).

H. Piping Surfaces to be Insulated:

Item to be Insulated	System Insulation Type	Pipe Size	Insulation Thickness
Hot Water Piping Above Grade (105F to 140F)	1	Runouts =<1-1/4-inch (uncirculated branches located in partitions within conditioned spaces) Mains =<1-1/4-inch Mains >1-1/4-inch	1-inch 1-inch 1-1/2-inch
Hot Water Circulation Piping Above Grade (105F to 140F)	1	Mains =<1-1/4-inch Mains >1-1/4-inch	1-inch 1-1/2-inch
Hot Water Piping Above Grade (141F to 200F)	1	Runouts =<1-1/4-inch (uncirculated branches located in partitions within conditioned spaces) Mains =<1-1/4-inch	1-inch 1-1/2-inch 2-inch

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		Mains >1-1/4-inch	
Hot Water Circulation Piping Above Grade (141F to 200F)	1	Mains =<1-1/4-inch Mains >1-1/4/inch	1-1/2-inch 2-inch
Cold Water Piping Above Grade	1	=<1-1/2-inch >1-1/2-inch	1/2-inch 1-inch
Hot Water Piping Below Grade	2	=<1-1/2-inch >1-1/2-inch	1-inch 1-1/2-inch
Hot Water Circulation Piping Below Grade	2	=<1-1/2-inch >1-1/2-inch	1-inch 1-1/2-inch
Water Piping Exposed to Weather	1, 2, 4	All	1-1/2-inch
Piping with Heat Tracing	1, 2, 4	Same as circulated hot water based on pipe size and service temperature.	
Above Grade Roof Drain / Overflow Drain Piping	1, 2	All	1/2-inch
Above Grade Storm Drainage / Sanitary Piping Receiving Condensate Drainage from Cooling Equipment	1, 2	All	1/2-inch
Roof Drain Underbodies	5, 6	N/A	1-inch
Overflow Roof Drain Underbodies	5, 6	N/A	1-inch
ADA Accessible Lavatory / Sink	7	All	As Listed
Storage Tanks	3, 5	All	2-inch
Condensate Drain Piping	1, 2	All	1/2-inch
Aboveground Refrigerated Water Systems	1, 2	All	1-inch
Solar Hot Water and Glycol Piping	1,4	=<1-1/2-inch >1-1/2-inch	1-inch 1-1/2-inch

3.02 TYPE 1, GLASS WOOL PIPE INSULATION

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions for below grade installation.

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C. Lap seal insulation with waterproof adhesive. Do not use staples or other methods of attachment which would penetrate vapor barrier. Apply fitting covers with seated tacks and vapor barrier tape.

D. Apply insulation to pipe and seal with self-sealing lap. Use self-sealing butt strips to seal butt joints. Insulate fittings, valves and unions with single or multiple layers of insulation and cover to match pipe or use preformed PVC molded insulation covers.

E. Above Grade Roof Drain/Overflow Drain Piping: Cover all roof drain piping and overflow drain piping with sectional pipe covering.

3.03 TYPE 2, FLEXIBLE ELASTOMERIC INSULATION

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions for below grade installation.

C. Slip insulation on pipe prior to connection. Butt joints sealed with manufacturer's adhesive. Insulate fitting with miter-cut pieces. Cover insulation exposed to weather and undergrade with two coats of finish as recommended by manufacturer.

D. Above Grade Roof Drain/Overflow Drain Piping: Cover all roof drain piping and overflow drain piping with sectional pipe covering.

E. Flexible Elastomeric Tubing: Slip insulation over piping or if piping is already installed, it should be slit and snapped over piping. Joints and butt ends must be adhered with 520 adhesive.

3.04 TYPE 5, GLASS WOOL EQUIPMENT INSULATION

A. See General Installation Requirements above.

B. Apply insulation and accessories to roof drain underbodies per manufacturer's recommendations.

C. Roof Drain/Overflow Drain Underbodies: Cover underside of drain body with glass wool insulation; attached with adhesive and supported externally with 26 gauge galvanized flat strapping anchored to structure.

D. Storage Tanks: Cover with glass wool, 2-inches thick. Finish with canvas jacket and adhesive. Overlap joints minimum of 4-inches. Apply two coats latex paint; color selected by Architect.

3.05 TYPE 7, ADA ACCESSIBLE LAVATORY/SINK INSULATION KIT

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions.

C. Provide lavatory/sink insulation kit. Install on waste fittings, hot and cold water stops and supplies.

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3.06 ACCESSORIES

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions.

C. Furnish and install accessories for all insulation types listed in this Section.

3.07 PIPE FITTING INSULATION COVERS

A. See General Installation Requirements above.

B. Install in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 22 10 00
PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Pump Waste Pressure Piping (Pumped Discharge)
2. Hot and Cold Domestic Water Above Grade
3. Primer Piping
4. Piping Specialties
5. Cleanouts

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. NSF 61, Annex G.
2. Steel pipe to conform to ASTM and ANSI Standards as specified in this Section.
3. Copper piping to conform to ASTM B88, B306 and B208 and the standards of Copper Development Association (CDA), and American Welding Society, (AWS).
4. Cast Iron Piping to conform to standards of ASTM A-74, CISPI 301 and FM 1680.
5. Manufacturer's Standards Society (MSS) for valving and support reference standard.
6. American Water Works Association (AWWA) for Valving Assembly Standards.
7. American Society of Sanitation Engineers (ASSE) for Valving Standards.
8. American National Standards Institute (ANSI) for Piping Standards.
9. NFPA Standard 51B - “Fire Prevention in Use of Cutting and Welding Processes.”

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10. Crosslinked polyethylene (PEX) pipe conforming to ASTM F876, F877 and CSA B1375, or DIN 16892 and 16893.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. See component manufacturers listed in individual articles below.

B. ADS

C. American-USA

D. Cerro

E. Charlotte

F. Clamp-All

G. Conbraco/Apollo Press

H. Elkhart

I. Enfield

J. Fuseseal

K. Gruvlok

L. Husky

M. Ideal

N. Mifab

O. Mission

P. Mueller

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Q. Nibco

R. Orion

S. Shurjoint Mechanical Couplings

T. Sioux Chief

U. Spears

V. Tyler

W. Uponor

X. Viega

Y. Zurn

Z. Or approved equivalent.

AA. Cleanouts:

1. J.R. Smith
2. Mifab
3. Sioux Chief
4. Wade
5. Watts
6. Zurn
7. Or approved equivalent.

BB. Firestopping Penetrations in Fire Rated Wall Floor Assemblies:

1. Hilti
2. Proset
3. Or approved equivalent.

2.02 GENERAL

A. Provide pipe, tube, and fittings of the same type, fitting requirements, grade, class, and the size and weight indicated or required for each service, as indicated in other Division 22, Plumbing Specifications. Where type, grade, or class is not indicated, provide proper selection as determined by installer for installation requirements, and comply with governing regulations and industry standards.

B. Manufactured materials delivered, new to the project site and stored in their original containers.

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C. Product Marking: Furnish each item with legible markings indicating name brand and manufacturer, manufacturing process, heat number and markings as required per ASTM and UL/FM Standards.

2.03 PUMP WASTE PRESSURE PIPING (PUMPED DISCHARGE)

A. Above Grade: Type "L" copper with solder joints.

B. Below Grade: Type "L" copper with brazed joints.

2.04 HOT AND COLD DOMESTIC WATER ABOVE GRADE

A. Copper Tube: 3-inches and above. ASTM B88 (ASTM BA88m), Type K (A), Drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: Brazed BCuP2.

B. Copper Tube: 2-1/2-inches and smaller. ASTM B88 (ASTM B88M), Type L (B), Drawn.

1. Fittings: ASME B16.18 copper.

2. Joints: ASTM B32, alloy Sn95 solder.

C. Stainless Tube:

1. Piping 3-inch and Larger: Grade H, ASTM A268/A268M-91, roll-grooved joint.

2. Fittings: Schedule 10S Type 304L stainless steel fittings, ISO 9001, ASTM A-403.

3. Couplings: Anvil or Gruvlok grooved system, IPS stainless steel grooved coupling with EPDM gasket, stainless steel nuts and bolts, ASTM-A351, A743 AND A744-CF-8M, ISO 9001.

D. Cross-Linked Polyethylene Tubing - Type "A" - Engle Method - Fittings and Accessories (except exposed locations).

1. Tubing:

a. Cross-linked polyethylene (PEX) tubing complies with requirements of ASTM F876 and F877, and cross-linking method must be Type A (hot) method.

b. PEX tubing to have minimum working pressure of not less than 160 PSI for water at 73.4 degrees F, 100 PSI for water at 180 degrees F and 80 PSI for water at 200 degrees F determined in accordance with Plastic Pipe Institute Technical Report TR-3/92, and listed in Plastic Pipe Institute Technical Report TR-4/95.

c. Co-extruded – “colored piping” (blue/red) is not to be utilized.

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2. Fittings:

a. Fittings: Engineered Plastic Fittings for above grade applications. Engineered plastic fittings for below grade applications. Serrated type with reinforcement rings.

b. Reinforcement Rings: Manufactured using "Engel Method" to ensure that viscoelastic stress regenerative properties are sufficient to produce pressure tight seal.

c. Fitting Insert: Of such dimension in that tubing must be expanded in order to facilitate insertion of fitting into tube.

d. Accomplish expansion of tubing and ring by an expansion tool designed expressly for that purpose.

e. Fittings complies with requirements of ASTM F877.

3. Manifolds: Provide premanufactured copper manifolds of same manufacturer as piping.

4. Stub-out Ells and Stub-out Brackets: Provide premanufactured Type L copper stub-out ells and copper stub-out brackets.

2.05 PRIMER PIPING

A. Above Ground: Type L hard-drawn copper tubing with wrought sweat fittings and soldered joints.

B. Below Ground: Type L soft annealed copper tubing with wrought sweat fittings and brazed joints.

C. Below Ground: Cross-linked polyethylene (PEX) and engineered plastic fittings.

2.06 PIPING SPECIALTIES

A. Pipe Escutcheons:

1. Provide pipe escutcheons as specified with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime zinc base paint finish for unoccupied areas.

2. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide stainless steel, cast brass or sheet brass escutcheons, solid or split hinged.

3. Pipe Escutcheons for Dry Areas: Provide stainless steel escutcheons, solid or split hinged.

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B. Low Pressure Y-Type Pipeline Strainers:

1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 percent of the working pressure of piping system with Type 304 stainless steel screens made with 1/16-inch perforations on 4-inch and smaller strainers, and 1/8-inch perforations on 6-inch and larger strainers.

2. Threaded Ends, 2-inch and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with plus.

3. Flanged Ends, 2-1/2-inch and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with hose bibb.

C. Air Vent with Valves:

1. Install automatic air vents in all closed and open-loop water systems at high points and at any other point necessary to free system of air. Provide shut-off valve in riser to each automatic vent valve to facilitate servicing. Manual type vent may be used in lieu of automatic type, where specifically shown on the Drawings.

2. Manufacturer: Hoffman #79.

D. Dielectric Waterways:

1. Provide standard products recommended by manufacturers in service indicated, which effectively isolate ferrous from non-ferrous piping (eliminating electrical conductance) to prevent galvanic action and stop corrosion.

2. Provide dielectric waterways or brass nipple fitting for transitions between dissimilar metal piping.

E. Unions:

1. Unions to comply with the following schedule:

a. Black Steel, 2-inch and smaller: 150 PSI screwed malleable iron, ground joint, brass to iron seat.

b. Black Steel, 2-1/2-inch and larger: 150 PSI cast iron screwed flanged, flat faced, full faced gasket.

c. Soldered Copper or Brass Pipe, 2-inch and smaller: 150 PSI cast bronzed or copper, ground joint, non-ferrous seat with soldered ends.

d. Screwed Copper or Brass Pipe, 2-inch and smaller: 150 PSI cast brass, ground joint, brass to brass seat, threaded ends.

e. Flanged Copper or Brass Pipe, 2-1/2-inch and larger: Two 150 PSI cast bronze flanges.

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f. Manufacturer: EPCO, Mueller, Stanley G. Flagg, Watts, or approved equivalent.

F. Flexible Piping Connectors - Expansion Loops or Seismic Joints:

1. Provide flexible expansion loops of size and material noted on Drawings. Design flexible loops to impart no thrust loads on the anchors. The loop consists of two flexible sections of hose and braid, two 90 degree elbows, and a 180 degree return. Install loops in a neutral, precompressed, or pre-extended condition as required for the application. Provide drain plug for loops installed hanging down. Loops installed straight up may be fitted with an automatic air release valve to purge air from the high point of the loop. Loops installed in any position other than hanging down must have the 180 degree return supported.

2. Copper Pipe: Copper fittings, bronze hose and braid sweat solder ends, Metraloop Series MLS 8000.

3. Steel Pipe: Schedule 40 carbon steel fittings, stainless steel hose and braid.

4. Threaded Ends: Metraloop Series MLT 80000.

5. Flanged Ends: Metraloop Series MLF 80000.

6. Welded Ends: Metraloop Series MLW 80000.

7. Grooved Ends: Metraloop Series MLG 80000.

8. Gas Lines, CSA Approved: Metraloop - Gas MLT or MLF Series.

9. Provide expansion joints by Mason, Flexionics, or Shur Fit, for vertical and horizontal straight run hot water and domestic hot water recirculation piping exceeding 1,000-feet. Install per manufacturer's installation directions.

2.07 CLEANOUTS

A. Locate cleanouts as shown on Drawings and as required by local code. Cleanouts same size as pipe except that greater than 4-inches will not be required. Plastic components not allowed, except unless specifically noted.

B. Types:

1. Tile Floor Cleanouts: J. R. Smith 4020 with round heavy-duty nickel bronze top, taper thread, ABS plug and standard screws.

2. Carpeted Floor Cleanout: J. R. Smith 4020-X with carpet clamping frame, round heavy-duty nickel bronze top, taper thread, ABS plug, carpet clamping device and standard screws.

3. Concrete Floor Cleanout (General): J. R. Smith 4020 with round heavy-duty nickel bronze top, taper thread and ABS plug with standard screws.

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4. Parking, Drives and Concrete Floor Cleanouts (Heavy Load): J. R. Smith 4100 with round heavy-duty nickel bronze top, taper thread and ABS plug with standard screws.

5. Wall Cleanout: J. R. Smith 4472-U, countersunk bronze taper thread plug, stainless steel shallow cover and vandalproof screws.

6. Outside Area Walks: J. R. Smith 4020-U with round heavy-duty nickel bronze top, taper thread, ABS plug and top secured with vandalproof screws. Install in 18- by 18- by 6-inch deep concrete pad flush with grade.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Underground Piping Systems:

1. Examination: Verify that excavations are to required grade, dry, and not over-excavated.

2. Perform necessary excavation and backfill required for installation of plumbing work. Repair piping or other work at no expense to Owner.

3. Water: Keep excavations free of standing water. Re-excavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.

4. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of testing laboratory.

5. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (muck, peat), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material. Adequate width of trench for proper installation of piping or conduit.

6. Support Foundations:

a. Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other Specification Sections or Drawings.

b. Over-Excavations: Where trench excavation exceeds required depths, provide, place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.

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c. Foundation Material: Where native material has been removed, place and compact necessary foundation material to form base for replacement of required thickness of bedding material.

	Class A		Class B	
Material Passing	**Min.**	**Max.**	**Min.**	**Max.**
3/4-inch Square Opening	**27**	**47**	**0**	**1**

d. Bedding Material: Full bed piping on sand, pea gravel, or 3/4-inch minus crushed rock. Place minimum 4-inch deep layer of sand, pea gravel, or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide firm foundation.

7. Backfilling:

a. Following installation and successful completion of required tests, backfill piping in lifts.

1) In "Pipe Zone" place backfill material and compact in lifts not to exceed 6-inches in depth to height of 12-inches above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.

2) Place and compact backfill above "Pipe Zone" in layers not to exceed 12-inches in depth.

b. Backfill Material:

1) Backfill Material in "Pipe Zone": 3/4-inch minus crushed rock, sand or pea gravel.

2) Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."

8. Compaction of Trench Backfill:

a. Where compaction of trench backfill material is required, use one of following methods or combination thereof:

1) Mechanical tamper,

2) Vibratory compactor, or

3) Other approved methods appropriate to conditions encountered.

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b. Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.

B. General Installation:

1. Work performed by experienced journeyman plumbers. No exceptions.

2. Provide access panels for concealed valves, shock arrestors, trap primers and the like.

3. Install pipes and pipe fittings in accordance with recognized industry practices and manufacturer's recommendations.

4. Align piping accurately at connections, within 3/32-inch misalignment tolerance. Comply with ANSI B31 Code for Pressure Piping.

5. Locate piping runs, as indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details, and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, and other structural and permanent-enclosure elements of building. Limit clearance to 1/2-inch where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1-inch clearance outside insulation. Whenever possible in finished and occupied spaces, conceal piping from view by locating it in column enclosures, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.

a. Do not run piping through transformer vaults, telephone, elevator, electrical or electronic equipment spaces or enclosures unless indicated on Drawings.

b. Concealed Piping Above Suspended Ceiling: Plan and coordinate to avoid interferences; install to maintain suspended ceiling heights shown on Architectural Drawings. Allow sufficient space above removable ceiling panels for panel removal. Locate piping so that valves are visible and accessible within 24-inches horizontally and vertically from point of access to the ceiling space. Provide plenum rated materials for ceiling spaces which are being used as plenums.

c. Exposed Work: Run pipes parallel to the closest wall unless otherwise shown on Drawings; maintain maximum headroom; avoid light fixtures.

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d. Insulation Space Allowance: In piping work, allow space for pipe insulation and jackets. If interferences occur, move the piping to accommodate insulation thickness specified.

e. Pipe Lengths: Do not use short lengths or nipples at locations where a full length of pipe will fit.

f. Alignment Prior to Supporting and Anchoring: Place piping in proper alignment and position prior to connection to anchors, expansion loops, and equipment. Furnish jacking devices, temporary steel structural members, and assembled structures as necessary. Remove temporary equipment and structures supplied by contractor at completion; such items to remain Contractor property.

g. Valve and Equipment Connections: Piping not to place undue stress on flanged valves and equipment connections. Install mating flange faces true and parallel to each other and not requiring springing of piping for assembly. Pipe hangers and supports to carry the full weight of the pipe and fluid.

h. Piping Leaks: Correct immediately; use new materials; leak-sealing compounds or peening not permitted.

i. Pressure Ratings of Fittings, Valves, and Devices in Piping Systems: Pressure rating to be equal to, or greater than, the maximum working pressure of the system.

j. Equipment Vents and Drains: Provide for coils and vessels which contain water. Provide isolation valves and outlet valves at piping high and low points to permit venting and draining of the vessel without venting and draining connected piping. Provide hose connections and caps on drain lines.

k. Escutcheon Plates: Where exposed insulated and uninsulated piping passes through walls, floors or ceilings; provide spring clip type. Provide plates on both sides of wall or floor.

C. Testing:

1. General:

a. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation (if any) is installed and remove or disengage control devices before testing. Where necessary, test sections of each piping system independently, but do not use piping valves to isolate sections where test pressures exceed local valve operating pressure rating. Fill each section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.

b. Notify Architect and local Plumbing Inspector 2 days before tests.

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c. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

d. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

e. Send test results to Architect for review and approval and include in Operation and Maintenance Manual.

2. Testing of Pressurized Systems:

a. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.

b. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.

3. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at hydrostatic pressure of 125 PSIG.

D. Corrosive Soil Conditions:

1. Wrap steel, iron, copper or other metal piping materials/fittings with Protecto Wrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per manufacturer's recommendations.

2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

3. Obtain and review project soils report for verification of requirements concerning corrosive soils.

E. Protection:

1. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter. Protect piping, ductwork, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore to its original condition or replace fixtures, equipment or apparatus damaged prior to final acceptance of work.

F. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

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1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

G. Cut piping squarely, free of rough edges and reamed to full bore. Insert piping fully into fittings.

H. Provide joints of type indicated in each piping system.

I. Thread pipe in accordance with ANSI/ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Remove excess cutting oil from piping prior to assembly. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

J. Sleeves:

1. Pipe Sleeves:

a. Layout work in advance of pouring concrete, furnish, and set sleeves necessary to complete work.

b. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with non-shrinking grout or approved caulking compound (except DWV Piping penetrating a concrete slab set on finish grade), provide modular link sealing system for concrete/slab penetrations which are below grade. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements

c. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Provide modular link sealing system for concrete penetrations which are below grade. Caulk/seal piping passing through fire-rated assemblies per local AHJ requirements.

d. Beam Sleeves: Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Indicate penetrations on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Plumbing Drawings are diagrammatic. Offset piping as required to meet these limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.

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2. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:

   a. Install fabricated pipe sleeve.

   b. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification.

   c. Seal each end airtight with a resilient nonhardening seal per code.

3. Piping penetrations through fire-rated (1 to 3 hour) assemblies:

   a. Select and install pre-engineered pipe penetration system in accordance with UL listing and manufacturer's recommendation.

   b. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E84.

3.02 PUMP WASTE PRESSURE PIPING (PUMPED DISCHARGE)

A. Excavation and Backfill:

1. See General Installation Requirements above.

B. Testing of Pressurized Systems:

1. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.

2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.

C. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

D. Braze copper tube and fitting socket with BCuP series filler metal without flux. Use listed brazing flux for joining of copper tube to brass or bronze fittings, meeting AWS FB3A or FB3C. "Shock" cooling is prohibited. A continuous fillet is to be visible around the completed joint. After cooling, thoroughly remove flux residue with warm water and a brush prior to testing. Do not use BCuP filler on copper alloys containing over 10 percent nickel. Cap or plug piping during construction to prevent entry of foreign material.

E. Welders performing work under this Contract to be certified and qualified in accordance with tests prescribed by the National Certified Welding Bureau (NCWB) or by other approved test procedures using methodology and procedures covered in the ASME Boiler and Pressure Vessel Code, Section IX, "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators." Installation to conform to ANSI 31.1 "Power Piping."

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1. Submit for approval the names, identification, and welder's assigned number, letter or symbol for welders assigned to this project.

2. Use the assigned identification symbol to identify the work of each welder and indelibly stamp immediately upon completion of each weld.

3. Welders to be tested and certified for all positions.

4. Submit identifying stenciled test coupons made by each operator.

5. Welders may be required to retake welding certification tests without additional expense.

6. When so requested, a welder will not be permitted to work as a welder on this project until he has been recertified in accordance with NCWB.

7. Recertification of the welder to be made after the welder has taken and passed the required tests.

F. Weld pipe joints in accordance with recognized industry practice and as follows:

1. Weld pipe joints only when ambient temperature is above 0F.

2. Bevel pipe ends at a 37.5 degree angle where possible, smooth rough cuts, and clean to remove slag, metal particles, and dirt.

3. Use pipe clamps or tack-weld joints with 1-inch long welds, 4 welds for pipe sizes to 10-inches, 8 welds for pipe sizes 12-inches to 20-inches.

4. Build up welds with a stringer-bead pass, followed by a hot pass, followed by a cover or filler pass. Eliminate valleys at center and at edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes, and non-metallic inclusions.

5. Do not weld out piping system imperfections by tack-welding procedures. Re-fabricate to comply with requirements.

6. At Installer's option, install forged branch-connection fittings whenever branch pipe is indicated, or install a regular T-fitting.

3.03 HOT AND COLD DOMESTIC WATER ABOVE GRADE

A. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

B. Testing of Pressurized Systems:

1. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.

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2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.

C. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at hydrostatic pressure of 125 PSIG.

D. Firestopping Penetrations in Fire-Rated Wall/Floor Assemblies:

1. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

E. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM Std. B-32, in accordance with IAPMO Is 3-93, ASTM B-828 and Copper Development Association recommended procedures. Clean joints by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes to be water soluble for copper and brass potable water applications, and meeting CDA standard test method 1.0 and ASTM B813-91. Apply solder until a full fillet is present around the joint. Do not apply solder and flux in such excessive quantities as to run down interior of pipe. Lead solder or corrosion flux not to be present at the jobsite.

F. Braze copper tube and fitting socket with BCuP series filler metal without flux. Use listed brazing flux for joining of copper tube to brass or bronze fittings, meeting AWS FB3A or FB3C. "Shock" cooling is prohibited. A continuous fillet is to be visible around the completed joint. After cooling, thoroughly remove flux residue with warm water and a brush prior to testing. Do not use BCuP filler on copper alloys containing over 10 percent nickel. Cap or plug piping during construction to prevent entry of foreign material.

G. Domestic Water:

1. "Piping" to include pipes, fittings, nipples, valves and accessories connected thereto.

2. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts, flues, conduits and work of other trades, and as close to ceiling or other construction as practical, free of unnecessary traps or bends.

3. Grade water supply piping for complete drainage of the system. Install hose bibbs at low points.

4. Use unions for piping connections to equipment.

5. Provide sufficient elbows, swings and offsets to permit free expansion and contraction.

6. Use reducers or increasers. Use no bushings.

7. Ream or file each pipe to remove burrs. Inspect each length of pipe and each fitting for workmanship and clear passageways.

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8. Cover, cap or otherwise protect open ends of piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect and sterilize water supply piping as specified. Furnish written report on final water quality results.

9. Install exposed connections to equipment with special care, showing no tool marks or threads at fittings and piping. No bowed or bent piping permitted.

10. Make ferrous to non-ferrous connections with dielectric fittings.

11. Use extra heavy pipe for nipples, where unthreaded portion is less than 1-1/2-inches. Use no close nipples. Use only shoulder-type nipples.

12. Through-Wall Pipes: Type 'L' copper tubing for through-wall pipes which connect to exposed stops at wall surface. Anchor the pipes in the wall; attach pipe with U-bolts to steel back-up plates or steel angles anchored in the wall. Provide wrought copper elbow which securely anchors ears in wall at through-wall pipes.

13. Provide drain valves at base of risers and at low points on the system.

14. Backflow Preventers: Pipe relief to nearest drain. Slope at 2 percent.

H. Sterilization of Domestic Water System:

1. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.

2. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.

3. Certification: Provide copy of domestic water chlorination certificate in each operations and maintenance manual.

4. Provide water line disinfections performed by a licensed contractor with training in potable water line disinfections.

3.04 PRIMER PIPING

A. Excavation and Backfill:

1. See General Installation Requirements above.

B. Testing:

1. See General Installation Requirements above.

3.05 PIPING SPECIALTIES

A. Excavation and Backfill:

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1. See General Installation Requirements above.

B. Drainage, Waste, and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

C. Corrosive Soil Conditions:

1. Wrap steel, iron, copper or other metal piping materials/fittings with Protecto Wrap 200, 30 mils or greater. Maintain a 1/2-inch overlap and install per manufacturer's requirements.

2. Provide epoxy coated cast iron pipe and fittings for drainage systems.

D. Cast-Iron Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.

3.06 CLEANOUTS

A. Install in aboveground piping and building drain piping as indicated, as required by code; at each change in direction of piping greater than 135 degrees; at minimum intervals of 100-feet; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish. Provide shop drawings to Architect to coordinate locations and types of cleanouts with Architect prior to installation.

END OF SECTION

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SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Electric Domestic Water Heating System
2. Duplex Sanitary Ejector Basins
3. Duplex Non-Clog Sewage Ejectors (Vertical Shaft/Pedestal with Wet Pit)

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Seismic anchor details and calculations signed and stamped by licensed Oregon structural engineer with equipment data.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. NSF 61, Annex G compliant.
2. ISO 9001 Certified.
3. IAPMO Low Lead Certification.

C. Products approved for installation by state authorizing agency, no exceptions.

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1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Electric Domestic Water Heating System:

1. Hubbell Series SH
2. Adamson
3. Bock
4. Rheem/Ruud
5. Or approved equivalent.

B. Duplex Sanitary Ejector Basins:

1. Weil
2. Goulds
3. Chicago
4. Hydromatic
5. Liberty
6. Zoeller
7. Or approved equivalent.

C. Duplex Non-Clog Sewage Ejectors (Vertical Shaft/Pedestal with Wet Pit) - Oil Filled:

1. Weil
2. Goulds
3. Chicago
4. Hydromatic
5. Liberty
6. Zoeller
7. Or approved equivalent.

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2.02 GENERAL

A. Reference Drawings for capacities and specific model numbers.

2.03 ELECTRIC DOMESTIC WATER HEATING SYSTEM

A. System: Domestic Hot Water

B. Pressure vessel section, including electrical control panel, mounted on structural supports and suitably insulated, jacketed, painted, and provided with lifting lugs. Entire unit is to be packaged ready for plumbing and electrical service connections and bear UL listing mark certifying entire water heater.

C. Pressure vessel welded construction and ASME Code Section IV stamped for working pressure of 125, 100, 150, 160 PSI. Storage vessel carbon steel and lined with seamless Hydrastone cement applied to minimum thickness of 5/8-inch on 100 percent of interior tank surfaces. Phenolic lined steel tank, 3 lb/sq. ft. copper lined steel tank, Hot dipped galvanized steel tank, Flame spray copper steel tank, Solid copper-silicon tank, Solid 90/10 copper-nickel tank, or Solid type 304 or 316L stainless steel tank.

D. Pressure vessel is to be completely covered with 2-inch thick "E" type energy conservation fiberglass blanket insulation and enclosed in heavy gauge galvanized steel metal jacket finished in gray hammertone enamel.

E. Vessel protected by an ASME approved automatic reseating combination temperature and pressure relief valve set at tank working pressure and 210 degrees F.

F. Heater designed to operate with fused low voltage transformer providing 120 volt to operating controls. Immersion heating element(s) high quality copper sheathed Incoloy Type 304 stainless steel Incoloy Type 316 stainless steel and sized to obtain rated recovery. Each element circuit is to be independently operated through definite purpose magnetic contactor having resistive load rating equal to or exceeding ampere rating of that particular circuit and protected by individual power fuses rated at approximately 125 percent of ampacity of circuit. Multiple circuit elements to be provided with master terminal block for connecting of incoming power feeds. Built-in non-fused On/Off disconnect switch. Built-in circuit breaker with On/Off handle. Safety door interlock switch interrupts power to control circuit when control panel door is opened. Control thermostat immersion type and consistent with recovery rate of heating element as to number of steps required. Hi-limit control with manual reset button to be factory installed to disconnect ungrounded conductors to heating element(s) in event of an over-temperature condition in storage section.

G. Water heater manufacturer warranties electrical components against defects in workmanship and material for period of one year from date of start-up, and pressure vessel for full 5 or 10 years non pro-rated from date of start-up, provided that unit is started within three months of date of shipment and installed and operated within scope of tank design and operating capability. Each water heater shipped with complete set of installation and operating instructions including spare parts list and approved drawing.

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2.04 DUPLEX SANITARY EJECTOR BASINS

A. System: Sanitary sewer.

B. Provide duplex submersible grinder pump, slide rail lift out feature mounted inside 48-inch diameter by 7-foot deep fiberglass wet well. Grinder unit to be capable of macerating material in normal domestic and commercial sewage including reasonable amounts of foreign objects, i.e., small wood sticks, plastic, thick rubber, sanitary napkins, and disposable diapers to fine slurry that will pass freely through pump. Also furnish valving, piping, access hatchways, level sensors and motor controls necessary to provide Owner with fully operational system.

C. Operating Criteria: Each grinder pump to deliver design flow capacity of 10 GPM of waste water at 35 TDH. Utility power to be 3-phase, 60HZ, 480V. Motor to be 2 HP, 3,450 RPM. Site Verify electrical power, prior to ordering.

D. Pump Construction:

1. Impeller: One-piece recessed bronze.

2. Shredder Ring and Grinder:

a. Grinder assembly to consist of grinder impeller and shredding ring mounted directly below volute passage. Grinder impeller to be threaded on stainless shaft. Shredder ring to have teeth angled 10 degrees from vertical. Ring is molded into volute case as an integral parts. Grinding of solids from action of impeller against shredding ring.

b. Both grinder impeller and shredding ring to be of 440C stainless steel hardened to 56-60 Rockwell C.

3. Volute:

a. Pump Volute Casting: High strength ASTM A48, Class 30B, close grain cast iron, one-piece nonconcentric design with smooth contoured surfaces.

b. Design volute to support entire operating weight of motor rotating assembly once lowered into place and connected to discharge elbow assembly.

E. Motor Construction:

1. Enclosure:

a. ASTM A48, Class 30B, close grain cast iron construction. Mating surfaces where watertight integrity is required accurately machined and fitted with BUNA-N "O" rings.

b. Each motor UL approved as explosionproof.

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2. Electrical Cables: Motor and sensor cables to be minimum 15-feet long of continuous unspliced cable. Cables to be of heavy-duty, portable submersible, hard service type, and to have multi-conductor, stranded copper leads and type SOW approved for use in waste water applications.

3. UL Rated Explosion Proof Motor: Oil filled, squirrel cage induction shell type. NEMA Design B. Stator windings to be triple dipped and baked in Class B varnish and insulation.

4. Motor Sensors: Motor starter temperature to be continuously monitored low resistance bimetallic (NC) normally closed, thermal switches embedded in stator windings. Designed to stop motor if motor winding temperature reaches 221 F and reset when motor cools.

5. Moisture Sensing: Provide moisture sensing probe for each submersible pump motor to detect moisture in seal chamber.

6. Shaft: One-piece extra heavy, high strength design, AISI 416 high chrome, stainless steel shafting, with high tensile and mechanical properties.

7. Bearings: Pump and motor shaft to rotate on two permanently lubricated ball bearings and third lower sleeve bearing.

8. Mechanical Seals: Provide each pump with tandem carbon/ceramic mechanical seals lubricated by oil.

9. Exposed Surfaces: Exposed nuts and bolts to be AISI 300 Series stainless steel. Protect external metal surfaces coming in contact with waste water other than brass or stainless steel by suitable primer and finished coat.

10. Rail System:

    a. Design of rail disconnect system permits easy removal and reinstallation of each pumping unit from wet well for inspection or service without disconnecting or disturbing discharge piping. Provisions to be made where no personnel are required to enter wet well.

    b. Accomplish installation of pump and engagement with discharge elbow by downward linear motion of pump. Pump discharge automatically connects with discharge elbow when lowered into place. Provide pump discharge as standard with resilient seat. No portion of pump to bear directly on floor of wet well.

11. Lifting Device: Provide each pumping unit with lifting cable of stainless steel construction, and of adequate strength to support live load weight of entire pump and motor assembly.

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12. Access Hatches: Pump system access hatch and frame to be of double door design, and fabricated of aluminum material. Rate access hatch to 150 lbs. per sq.ft. live load. Provide hinged access hatch with hasp and staple locking device as standard, and with nonskid surface on closed position. Accessories provided with hatch to be, upper guide rail support bracket, level sensor, power cable holder bracket, lifting cable hooks and locking bar to secure hatch in open position.

13. Furnish remote packaged factory pre-wired alternative duplex explosion proof pump controller with the following:

    a. NEMA 1 double door dead front steel lockable enclosure.

    b. Magnetic starter with overload reset through cover, each pump.

    c. Fused disconnect switch with handle through cover, each pump.

    d. Automatic alternator, separately fused.

    e. Overload reset buttons, each pump.

    f. Running lights, each pump.

    g. H-O-A switches, each pump.

    h. Controller provided with electronic devices to control flow alarm switches on four designated hydrostatic relief pipes. In event of an alarm sewage ejector system will shut down. Controller to be provided with Manual Reset switch. Automatic reset is prohibited for this operating system. Provide summary output alarm contact set to signal sewage ejector system shut down to building information system.

    i. Control circuit transformer for 120V operation for each pump.

    j. Output connections for hi-water annunciation.

    k. Alarm silencing switch.

    l. Alarm light with flasher.

    m. Numbered and wired terminal strip.

    n. Single point electrical connection.

    o. Wiring between control panel and pump provided under Division 22, Plumbing.

14. Duplex Pump Control:

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a. Furnish and install mercury float switches complete with galvanized rod and wall support bracket. Each pump control switch will consist of 2 normally open mercury switches, encapsulated in epoxy resin. Float casing will be polypropylene. Switch cable will be Type STO PVC jacket 4 #18 conductor. 41 strand, 600 volt insulation. Cable will be secured to support rod with polypropylene composition clamp with stainless steel bolts. Switches used for high water alarm service will be of same construction as pump switches, except that 2 conductor cables will be furnished. Switch housing will be color coded to distinguish between pump and alarm switches.

2.05 DUPLEX NON-CLOG SEWAGE EJECTORS (VERTICAL SHAFT/PEDESTAL WITH WET PIT)

A. Pump Construction:

1. Impeller:

a. One-piece ASTM A48, Class 30B, close grain, cast iron double shrouded design, non-clog design, with large smooth contours, without acute turns, free of blowholes and imperfections. Large free passages capable of handling solids, fibrous materials, sludge and other matter normally found in conventional wastewater applications.

b. Two vane design, high efficiency throughout broad-band operating range, capable of passing minimum 1-3/4-inch sphere.

c. Capable of field trimming and balancing to meet actual site specific conditions. Key driven to motor shaft. Attached to shaft by means of locking washers and impeller screw of AISI-304 stainless steel.

2. Volute:

a. High strength ASTM A48, Class 30B, close grain cast iron, single piece non-concentric design with smooth contoured surfaces and fluid passages capable of passing any solid which passes through impeller.

b. Non-Clog Volutes 6-inches and Larger: Double volute passages to minimize radial shaft loading.

3. Motor Support Bracket: ASTM A48, Class 30B, close grain cast iron. Integral thrust bearing housing minimum of 6-inches above floor.

4. Shafts: AISI 416 S.S. main pump shaft and AISI 303 S.S. lower stub shaft.

5. Upper Thrust Bearing: Single row, deep groove, ball bearing design mounted in dustproof housing with moisture seal.

6. Lower Pump Bearing: Media lubricated fluted synthetic design.

7. Intermediate Bearing: Media lubricated PACOLOY composition intermediate bearing for each 4 foot increment of column beyond initial 6 foot of sump depth.

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8. Column: Schedule 40 steel column with machined flanges, assuring perfect alignment between pump volute and motor.

B. Motor Construction: Vertical mounted, C-face drip proof electric motor of ball bearing design, directly connected to pump through flexible coupling.

C. Pump Accessories:

1. Sump Cover: Steel, 1/2-inch-thick, vapor-tight construction with subplates and openings as indicated on Drawings.

2. Sump Basin: Steel sump basin with inlet and vent connections as indicated on Drawings.

D. Controls:

1. Control Panel: Mount electrical controls inside NEMA 1 enclosure fabricated of steel. Provided with through door disconnect and bear UL label of an enclosure manufacturer. Single point connection.

2. Components to bear UL Label. Wiring, workmanship and schematics will comply with standards set forth by NEC.

3. Wiring/Conduit: Pilot duty volt control circuit wiring inside control panel, is minimum of MTH, 600 volt rated, 18 gauge with 90C temperature rating in accordance with UL standards. Conduit connections UL listed and installed in accordance with CEC standards. Size current carrying wire and conduit in accordance with CEC standards.

4. Motor Protection: Protect each pump motor with magnetic motor starter of open, across-the-line type, bearing UL label for motor control devices and properly sized by motor horsepower. Equip motor starters with undervoltage release and overload protection. Mount an overload reset button through door to permit resetting of starter overload without opening panel door.

5. Mercury Level Sensor: Control with field adjustable, sealed mercury level sensors to sense wet well level and control pumping cycles. Provide electrical interlocks to maintain pump operation between each level.

6. Activate remote mounted NEMA 3R red alarm light. from high level alarm sensor.

7. Activate an audible-visible combination remote mounted NEMA 3R red light and (bellhorn) from high water alarm sensor. Provide "Push-to-Silence" button to relay silencing audible alarm. Wire relay so that visual light will continue to indicate an alarm condition until condition has been corrected.

8. Dry Telemetry Contacts: Provide dry telemetry contacts inside control panel to interface with local alarms.

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PART 3 - EXECUTION

3.01 GENERAL

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Orients so controls and devices needing service and maintenance have adequate access.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

E. Connect water piping to units with shutoff valves and unions.

F. Equipment Rigging: Heavy duty rigging eye bolts for Crosby Group swivel hoist rings installed over pump access covers for removal or maintenance.

G. Equipment Start-Up:

1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.

2. Start-up performed by authorized manufacturer's representative or agent. Provide credentials of start-up personnel to Architect and Owner's Authorized Representative for approval.

3. Remove and replace filters when start-up testing is executed.

4. Manufacturer adjusts operating parameters of equipment to compensate to elevation of 500-feet above sea level.

5. Architect, Commissioning Agent, and Owner's Authorized Representative will be notified 10 days prior to start-up and will be present at start-ups.

6. Provide written report from manufacturer's representative on results of start-up within 48 hours.

7. Technical Training of maintenance staff includes two hours minimum per each piece of equipment.

8. Seismic Verification:

a. Contractor will retain structural engineer who will submit stamped and signed anchoring and restraint details on plumbing equipment with submittal data in accordance with Division 22, Plumbing requirements.

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b. Contractor's Structural Engineer will test and verify in writing that seismic restraints have been installed in accordance with their details.

3.02 ELECTRIC DOMESTIC WATER HEATING SYSTEM

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Orients so controls and devices needing service and maintenance have adequate access.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

E. Connect water piping to units with shutoff valves and unions.

3.03 DUPLEX SANITARY EJECTOR BASINS

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Orients so controls and devices needing service and maintenance have adequate access.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

E. Connect water piping to units with shutoff valves and unions.

F. Equipment Start-Up:

1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.

2. Start-up performed by authorized manufacturer's representative or agent. Provide credentials of start-up personnel to Architect and Owner's Authorized Representative for approval.

3. Remove and replace filters when start-up testing is executed.

4. Manufacturer adjusts operating parameters of equipment to compensate to elevation of 500-feet above sea level.

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5. Architect, Commissioning Agent, and Owner's Authorized Representative will be notified 10 days prior to start-up and will be present at start-ups.

6. Provide written report from manufacturer's representative on results of start-up within 48 hours.

7. Technical Training of maintenance staff includes two hours minimum per each piece of equipment.

8. Seismic Verification:

   a. Contractor will retain structural engineer who will submit stamped and signed anchoring and restraint details on plumbing equipment with submittal data in accordance with Division 22, Plumbing requirements.

   b. Contractor's Structural Engineer will test and verify in writing that seismic restraints have been installed in accordance with their details.

3.04 DUPLEX NON-CLOG SEWAGE EJECTORS (VERTICAL SHAFT/PEDESTAL WITH WET PIT)

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Orients so controls and devices needing service and maintenance have adequate access.

D. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

E. Connect water piping to units with shutoff valves and unions.

F. Equipment Start-Up:

1. Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls.

2. Start-up performed by authorized manufacturer's representative or agent. Provide credentials of start-up personnel to Architect and Owner's Authorized Representative for approval.

3. Remove and replace filters when start-up testing is executed.

4. Manufacturer adjusts operating parameters of equipment to compensate to elevation of 500-feet above sea level.

5. Architect, Commissioning Agent, and Owner's Authorized Representative will be notified 10 days prior to start-up and will be present at start-ups.

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6. Provide written report from manufacturer's representative on results of start-up within 48 hours.

7. Technical Training of maintenance staff includes two hours minimum per each piece of equipment.

8. Seismic Verification:

   a. Contractor will retain structural engineer who will submit stamped and signed anchoring and restraint details on plumbing equipment with submittal data in accordance with Division 22, Plumbing requirements.

   b. Contractor's Structural Engineer will test and verify in writing that seismic restraints have been installed in accordance with their details.

END OF SECTION

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SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. General Plumbing Fixtures:

a. China Fixtures, White Only

b. Enameled Steel Fixtures, White Only

c. Faucet Fittings

d. Fiberglass Fixtures, White Only

e. Stainless Steel Fixtures

f. Thermostatic Mixing Valves

g. Trench Drains

2. Fixture Trim

3. Flushometers - Water Closet/Urinal

4. Water Closet Seats

5. Drain Boxes

6. Stainless Steel Drainage Fittings

1.02 RELATED SECTIONS

A. Contents of Division 22, Plumbing and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

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B. In addition, meet the following:

1. Comply with lead free (less than or equal to 0.25 percent) products in drinking water systems.

2. NSF 61, Annex G, Drinking Water System Components, Compliant.

3. ISO 9001, Quality Management Standard Certified.

4. IAPMO Low Lead Certification.

5. Provide fixtures, faucets and accessories to meet barrier free requirements of the governing code with respect to plumbing fixtures provided for the physically handicapped.

6. Items approved for use by State of Oregon.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00, Plumbing Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. "Or approved equivalent" as defined in 22 00 00, Plumbing Basic Requirements. Substitution process requirements apply to approved equivalent products.

B. General Plumbing Fixtures: See Schedule on Drawings for type.

1. China Fixtures - White Only:

a. American Standard

b. Briggs

c. Crane

d. Eljer

e. Kohler

f. Universal-Rundle

g. Or approved equivalent.

2. Enameled Steel Fixtures - White Only:

a. American Standard

b. Briggs

c. Crane

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d. Eljer

e. Kohler

f. Universal-Rundle

g. Or approved equivalent.

3. Faucet Fittings:

a. Private:

1) Chicago

2) Delta Commercial

3) Moen

4) Speakman

5) Symmons

6) T&S Brass

7) Or approved equivalent.

b. Public:

1) American Standard

2) Chicago

3) Delta Commercial

4) Moen Commercial

5) Sloan

6) Symmons

7) T & S Brass

8) Or approved equivalent.

4. Fiberglass Fixtures - White Only:

a. Aqua-Glass

b. Briggs

c. Crane

d. Comfort Designs

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e. Florestone

f. Hytec

g. Mustee

h. Universal-Rundle

i. Or approved equivalent.

5. Stainless Steel Fixtures:

a. Acorn Engineering

b. Haws

c. Zurn

d. Elkay

e. Or approved equivalent.

6. Thermostatic Mixing Valves:

a. Bradley

b. Caleffi

c. Holby

d. Powers

e. Symmons

f. Or approved equivalent.

7. Trench Drains:

a. Channel-Slope

b. JR Smith

c. Mifab

d. PolyDrain

e. Polycast

f. Quazite

g. Zurn

h. Or approved equivalent.

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C. Fixture Trim:

1. McGuire
2. Dearborn Brass
3. Oatey
4. Or approved equivalent.

D. Flushometers - Water Closet/Urinal:

1. Delaney
2. Sloan
3. Zurn
4. Or approved equivalent.

E. Water Closet Seats:

1. Bemis
2. Or approved equivalent.

F. Drain Boxes:

1. Sioux Chief
2. Or approved equivalent.

G. Stainless Steel Drainage Fittings:

1. Blucher
2. Josam
3. JR Smith
4. Kusel
5. Mifab
6. Zurn
7. Or approved equivalent.

2.02 GENERAL PLUMBING FIXTURES

A. Review substitution request requirements in Division 01, General Requirements and 22 00 00, Plumbing General Requirements.

B. Reference Architectural Details for mounting height and location of fixtures.

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C. Provide factory fabricated fixtures of type, style and material indicated on the plumbing fixture connection schedule shown on the Drawings. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by manufacturer, or required for complete installation. Where more than one type is indicated, selection is installer's option; but, fixtures of same type must be furnished by a single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

D. Provide fixtures complete with fittings, supports, fastening devices, bolt caps, faucets, valves, traps, stops and appurtenances.

E. Plumbing Fixture Flow Rates:

1. Water Closets: Single flush at 1.28 GPF.

2. Lavatories in public core areas to be set for a maximum of 0.5 GPM flow. Other lavatories to be 1.0 GPM flow.

3. Sinks to be set for a maximum of 1.5 GPM flow.

F. Plumbing Fixture Thermostatic Mixing Valves:

1. Lavatories provide ASSE 1070 compliant mixing valves or multiple lavatories served by a single ASSE 1070 compliant mixing valve.

2. Sinks serviced with a single ASSE 1070 mixing valve or multiple sinks served by a single ASSE 1070 mixing valve.

3. Commercial kitchen handsinks provide ASSE 1070 mixing valves.

4. Janitor sinks or process/maintenance type sinks do not require ASSE 1070 mixing valves if operated by trained personnel. Provide signage per Section 22 05 53, Identification for Plumbing Piping and Equipment.

5. Hot water hose bibbs do not require ASSE 1070 mixing valves if operated by trained personnel. Provide signage per Section 22 05 53, Identification for Plumbing Piping and Equipment.

2.03 FIXTURE TRIM

A. Traps: Provide heavy duty commercial grade traps on fixtures except fixtures with integral traps. Exposed traps will be chromium plated cast brass or 17-gauge chromium plated brass tubing.

1. Sink: McGuire 8912CDF.

2. Lavatory: McGuire 8902CDF.

B. Supplies and Stops: Lead free heavy duty commercial grade, chrome plated with brass stems. Stops: T-handle or Loose Key type.

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1. Lavatory: McGuire LFH2165LK.

2. Sink: McGuire LFH2167LK.

3. Water Closets: McGuire.

C. Lavatory Grid Strainer: McGuire 155A.

D. Sink Grid Strainer: McGuire 152N.

E. Shower Grid Strainer: McGuire 1266.

F. Sink Basket Strainer: McGuire 151.

G. Trim barrier-free wrap for P-traps and supplies by McGuire, Pro-Wrap, Plumberex or Truebro.

H. Escutcheons: McGuire wrought brass deep bell.

I. Wax Rings and Toilet Bolts: WM Harvey No Seep No. 1 053065-N.

2.04 FLUSHOMETERS - WATER CLOSET/URINAL

A. See Schedule on Drawings for types.

2.05 WATER CLOSET SEATS

A. See Schedule on Drawings for type.

2.06 DRAIN BOXES

A. See Schedule on Drawings for type.

B. Provide fire rated ASTM E-84 rated boxes where required by building construction.

2.07 STAINLESS STEEL DRAINAGE FITTINGS

A. Austenitic Stainless Steel of Material type (304/316) and gauge as listed in the plumbing fixture schedule.

PART 3 - EXECUTION

3.01 GENERAL PLUMBING FIXTURE INSTALLATION INFORMATION

A. Verification of Conditions:

1. Examine rough-in work of water supply and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping and other unsatisfactory conditions for installation of plumbing fixtures.

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2. Examine walls, floors and cabinets for suitable conditions where fixtures are to be installed.

3. Install plumbing fixtures level and plumb, in accordance with fixture manufacturer's written instructions, rough-in drawings and pertinent codes and regulations, design and referenced standards.

4. Fasten plumbing fixtures securely to supports or building structure. Secure supplies behind or within wall construction to provide rigid installation.

5. Install a stop valve in a readily accessible location in water connection to each fixture.

6. Install escutcheons at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.

7. Seal fixtures to walls and floors using silicone sealant Dow Corning No. 780 or approved equivalent. Match sealant color to fixture color.

8. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning units, then retest.

9. Inspect each unit for damage prior to installation. Replace damaged fixtures.

10. Replace washers or cartridges of leaking or dripping faucets and stops.

11. Clean fixtures, trim and strainers using manufacturer's recommended cleaning methods and materials.

12. During construction, cover installed fixtures, drains, sinks and water coolers with cardboard and wrap with sheet plastic.

13. Provide trap primers for floor drains, floor sinks, trench drains and hub drains.

14. Install roof and overflow roof drains per architectural details. Cover drains during roof construction to protect drain. Provide offsets or expansion joints at each roof/overflow drain.

15. Do not use lead flashing.

B. Owner Furnished Equipment:

1. Rough-in and make final connections to Owner furnished equipment. Provide necessary items to complete installation.

2. Comply with requirements of this Section and Drawings for installation procedures.

C. Adjusting and Cleaning: Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation. Adjust water pressure at drinking fountains, faucets, shower valves and flush valves to provide proper flow stream and specified GPM. Repair leaks at faucets and stops.

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D. Extra Stock: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner.

E. Field Quality Control: Upon completion of installation of plumbing fixtures, test fixtures to demonstrate capability and compliance with Specifications. Correct or replace malfunctioning units at site, then retest to demonstrate compliance.

F. Protection: Protect fixtures and equipment from damage. Cover finished fixtures with cardboard and sheet plastic. Fixtures are not to be used during construction. Replace damaged items with new.

G. Signage: For fixtures that do not have ASSE 1070 mixing valve protection for hot water temperature, provide signage per Section 22 05 53, Identification for Plumbing Piping and Equipment.

3.02 FIXTURE TRIM INSTALLATION

A. Install components in accordance with manufacturer's instructions and approved product data submittals.

B. Set plumb, level and rigid.

3.03 FLUSHOMETERS - WATER CLOSET/URINAL INSTALLATION

A. Install components in accordance with manufacturer's instructions and approved product data submittals.

B. Set plumb, level and rigid.

3.04 WATER CLOSET SEATS INSTALLATION

A. Install components in accordance with manufacturer's instructions and approved product data submittals.

B. Set plumb, level and rigid.

3.05 DRAIN BOXES INSTALLATION

A. Install components in accordance with manufacturer's instructions and approved product data submittals.

B. Set plumb, level and rigid.

3.06 STAINLESS STEEL DRAINAGE FITTINGS

A. Install components in accordance with manufacturers instructions and approved product data submittals.

B. Set plumb, level and flush to surrounding surfaces unless specifically noted otherwise.

C. As applicable install clamping devices-flanges to receive surface finish products (flooring, membranes etc.).

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END OF SECTION

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SECTION 23 00 00
HEATING, VENTILATING AND AIR CONDITIONING (HVAC) BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 DESIGN-BUILD SUMMARY

A. Work included in 23 00 00 applies to Division 23, Heating, Ventilating and Air Conditioning (HVAC) work to provide materials, labor, tools, permits and incidentals to make HVAC systems ready for Owner's use for proposed project.

1.02 DESIGN-BUILD INSTRUCTIONS

A. This document is issued to give Bidders a basis for preparing a proposal to design and install complete HVAC systems for this project.

B. Alternates to this Document may be offered as a separate proposal.

C. Bidder to submit the following information with the Proposal:

1. Preliminary drawings indicating major equipment locations and preliminary layout.

2. Description of systems, manufacturer and method of control.

3. List of materials proposed for systems which are applicable to this project.

4. Any other information which the bidder considers pertinent in evaluating the proposal.

1.03 DESIGN-BUILD APPROACH

A. Use this Specification for design/engineering requirements, workmanship and materials or construction. Utilize design-build concept throughout construction phase of project.

B. Investigate and be apprised of applicable codes, rules, and regulations as enforced by Authority Having Jurisdiction (AHJ).

C. Visit the Site of the proposed construction. Verify and inspect the existing site to determine conditions that affect this work.

1.04 DESIGN-BUILD CRITERIA/CALCULATIONS

A. Related Work Specified Elsewhere: Contents of Section apply to Division 23 Specifications. Requirements of Section are a minimum for Division 23 Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.

B. Design Criteria: Reference Basis of Design narrative document.

C. Design Criteria:

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1. HVAC System: Constant air volume packaged rooftop gas heating/electric cooling units. Provide supply and return air ductwork. Mount diffusers/grilles in ceiling grid. Maximum duct velocity to be 1100 FPM. Provide one HVAC unit per space. In addition, provide two equally sized units on spaces over 4500sf.

    a. Cooling Temperatures:

        1) 74 Degrees F DB, 63 Degrees F WB Inside Design

        2) 95 Degrees F DB, 67 Degrees F WB Outside Design

    b. Heating Temperatures:

        1) 70 Degrees F DB Inside Design

        2) 10 Degrees F DB Outside Design

    c. Lighting: 1.6 w/sf (this exceeds w/sf requirements of energy code to allow to install luminaires which are exempt from calculation requirements.)

    d. Miscellaneous Electrical Load: 2 w/sf.

    e. Acoustical Requirements: Sound generated by HVAC system in occupied zone of a treated space not-to-exceed noise criterion of NC-35.

    f. Provide exhaust systems to toilet and janitor's rooms. The exhaust systems provide a minimum of 10 air changes per hour.

    g. Provide drawings with duct layout, exhaust fans, A/C units, size, and description of equipment, heating/cooling load calculations, equipment selections, etc. for review and for permit process. Coordinate ceiling diffuser locations with Architectural Drawings and Lighting Plan.

    h. Outside air ventilation to be designed per current state ventilation code or ASHRAE recommendations, whichever is greater.

    i. Provide calculations and installation details of equipment mounting to structure to conform to local seismic codes. Calculations and details to be included on Drawings as a part of submittal process.

    j. Provide equipment and/or devices for pressure control of spaces so as not to over pressurize space.

    k. Provide independent cooling only split systems for elevator equipment rooms.

2. Coordinate gas meter (and regulator) location with utility company. Provide gas piping from meter to HVAC equipment as required. Provide for costs incurred as required by local gas utility. Utilize 2 PSI delivery pressure unless not available. Coordinate with serving utility.

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3. Controls:

   a. Complete bidder designed temperature control system as described in these specifications. Building Automation System (BAS) Manufacturer to furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems.

   b. Materials and equipment used to be standard components, regularly manufactured for this and other systems and not custom designed specially for this project. Provide systems and components thoroughly tested and proven in actual use for at least 2 years.

   c. Provide line and low voltage wiring for a complete and operable system. Wiring in accordance with local, State and National Codes.

   d. DDC controller programmed through a personal computer (PC) with printer, alarm reporting and graphics. PC includes a modem.

   e. Provide controllers for equipment unless specifically specified otherwise. Coordinate with equipment suppliers.

   f. Provide system capable of handling equipment scheduled and shown on Drawings.

4. Air Distribution Duct System:

   a. Provide ductwork, including collars, register boxes, fire dampers, fire/smoke dampers, exhaust fans, ventilation louvers, roof vents and screens, as well as dampers and other miscellaneous items not specifically mentioned but necessary for a complete installation. Apply latest Standards of SMACNA and/or ASHRAE with respect to sheet metal gauge and general construction for round and rectangular ducts.

D. Calculations:

1. Submit heating and cooling load calculations per ASHRAE Standards for each HVAC zone.

2. Submit natural gas sizing calculations.

3. Submit structural calculations for seismic bracing of HVAC equipment and piping. Structural calculations to be signed by a Registered Engineer in the State of Oregon.

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1.05 SECTION INCLUDES

A. Work included in 23 00 00, HVAC Basic Requirements applies to Division 23, HVAC work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of heating, ventilating and air conditioning systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.

2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.

3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work provided.

4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.

5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.06 RELATED SECTIONS

A. Contents of Section applies to Division 23, HVAC Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:

a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

b. Drawings

c. Addenda

d. Owner/Architect Agreement

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e. Owner/Contractor Agreement

f. Codes, Standards, Public Ordinances and Permits

1.07 REFERENCES AND STANDARDS

A. References and Standards per Division 01, General Requirements, individual Division 23, HVAC Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:

a. OAR - Oregon Administrative Rules

b. 2023 OESC - Oregon Electrical Specialty Code

c. 2022 OFC - Oregon Fire Code

d. 2022 OMSC - Oregon Mechanical Specialty Code

e. 2023 OPSC - Oregon Plumbing Specialty Code

f. 2022 OSSC - Oregon Structural Specialty Code

g. 2021 OEESC - Oregon Energy Efficiency Specialty Code

h. 2024 Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:

1. ABA - Architectural Barriers Act

2. ABMA - American Bearing Manufacturers Association

3. ADA - Americans with Disabilities Act

4. AHRI - Air-Conditioning Heating & Refrigeration Institute

5. AMCA - Air Movement and Control Association

6. ANSI - American National Standards Institute

7. ASCE - American Society of Civil Engineers

8. ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers

9. ASHRAE Guideline 0, The Commissioning Process

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10. ASME - American Society of Mechanical Engineers
11. ASPE - American Society of Plumbing Engineers
12. ASSE - American Society of Sanitary Engineering
13. ASTM - ASTM International
14. AWWA - American Water Works Association
15. CFR - Code of Federal Regulations
16. CGA - Compressed Gas Association
17. CISPI - Cast Iron Soil Pipe Institute
18. EPA - Environmental Protection Agency
19. ETL - Electrical Testing Laboratories
20. FM - FM Global
21. GAMA - Gas Appliance Manufacturers Association
22. HI - Hydraulic Institute Standards
23. IAPMO - International Association of Plumbing & Mechanical Officials
24. IFGC - International Fuel Gas Code
25. ISO - International Organization for Standardization
26. MSS - Manufacturers Standardization Society
27. NEC - National Electric Code
28. NEMA - National Electrical Manufacturers Association
29. NFPA - National Fire Protection Association
30. NFGC - National Fuel Gas Code
31. NRCA - National Roofing Contractors Association
32. NSF - National Sanitation Foundation
33. OSHA - Occupational Safety and Health Administration
34. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
35. TEMA - Tubular Exchanger Manufacturers Association

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36. TIMA - Thermal Insulation Manufacturers Association

37. UL - Underwriters Laboratories, Inc.

D. See Division 23, HVAC individual Sections for additional references.

1.08 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 23, HVAC Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:

1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail and be native/searchable PDF format. Scanned copies are not acceptable. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. At Contractor's option, four separate submittals may be provided, consisting of long lead items, underground/site work, building work, and building automation system. Deviations will be returned without review.

3. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 23, HVAC Sections.

4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.

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a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.

b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 23, HVAC Specification Sections for specific items required in product data submittal outside of these requirements.

c. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.

d. For vibration isolation of equipment, list make, and model selected with operating load and deflection.

e. See Division 23, HVAC individual Sections for additional submittal requirements outside of these requirements.

5. Maximum of two reviews of submittal package. Arrange for additional reviews and/or early review of long-lead items; bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

6. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.

7. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required by Division 23, HVAC Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.

8. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

9. Substitutions and Variation from Basis of Design:

a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.

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b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties proposing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to bid.

10. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, equipment, ductwork and piping layout plans, and control wiring diagrams. Reference individual Division 23, HVAC Specification Sections for additional requirements for shop drawings outside of these requirements.

    a. Provide Shop Drawings indicating access panel locations for items that require Code or maintenance access, size and elevation for approval prior to installation.

11. Samples: Provide samples when requested by individual Sections.

12. Resubmission Requirements:

    a. Make corrections or changes in submittals as required in response to Engineer’s comments. Provide a cover letter with resubmittal that includes responses to each of the Engineer’s submittal review comments and identifies changes in the resubmittal. Cloud changes in the submittals.

        1) Resubmit for review until review indicates “no exception taken” or “make corrections noted.”

        2) When submitting drawings for Engineer's re-review, clearly indicate changes on drawings and cloud any revisions. Submit a list describing each change.

13. Operation and Maintenance Manuals, Owner's Instructions:

    a. Submit, at one time, electronic files (native/searchable PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.

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1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.

2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.

3) Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Sections.

4) Include product certificates of warranties and guarantees.

5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.

6) Include copy of startup and test reports specific to each piece of equipment.

7) Include copy of final air and water systems balancing log along with pump, fan and distribution system operating data.

8) Include commissioning reports.

9) Include copy of valve charts/schedules.

10) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 23 00 00, HVAC Basic Requirements Article titled "Demonstration."

c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

14. Record Drawings:

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a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

b. Record Drawings are to include equipment and fixture/connection schedules, control dampers, fire smoke dampers, fire dampers, valves, bottom of pipe, duct and equipment elevations and dimensioned locations for all distribution systems (hydronic and air). Invert elevations and dimensioned locations for underground systems below grade to 5-feet outside building that accurately reflect "as constructed or installed" for project.

c. At completion of project, input changes to original project Revit Model and make one set of black-line drawings created from Revit model in version/release equal to contract drawings. Submit Revit model and drawings upon substantial completion.

d. See Division 23, HVAC individual Sections for additional items to include in record drawings.

1.09 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturers' written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

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E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Provide products that are UL listed.

G. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

1.10 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Contracting and Procurement Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.11 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, equipment, fire sprinklers, plumbing, cable trays, lights, and electrical services with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

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2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.

B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:

1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.

2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.

3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Install equipment having components requiring access (i.e., drain pans, drains, control operators, valves, motors and vibration isolation devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions including all appurtenances recommended in manufacturer's installation instructions, at no additional charge to Owner. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.

D. Earthwork:

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1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

    a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork Sections. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.

    b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.

    c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:

1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

    a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Pipe Installation:

1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building, as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, seismic flexible joints, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating for coordinating installation of piping systems.

2. Include provisions for servicing and removal of equipment without dismantling piping.

G. Plenums:

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1. Plenums: Materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84 or UL 723. Immediately notify Architect/Engineer of any discrepancy.

H. Provide miscellaneous supports/metals required for installation of equipment, piping, and ductwork.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 23 HVAC Sections.

B. Equipment Importance Factor: See Seismic Design Summary Table on Drawings for Importance Factors and Special Inspections Requirements.

C. General:

1. Earthquake resistant designs for HVAC (Division 23) equipment and distribution, i.e. motors, ductwork, piping, equipment, etc. to conform to regulations of jurisdiction having authority.

2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.

4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.

D. Piping and Ductwork:

1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.

E. Provide means to prohibit excessive motion of mechanical equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

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B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1. Underground system installation prior to backfilling.

2. Prior to covering walls.

3. Prior to ceiling cover/installation.

4. After major equipment is installed.

5. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Final Punch:

1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Mechanical Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the mechanical systems are ready for final punch.

2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).

2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.

3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.

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4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.

5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.05 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

B. Maintain design intent where equipment other than as shown as Basis of Design in Contract Documents is provided. Where equipment requires ductwork or piping arrangement, controls/control diagrams, or sequencing different from that indicated in Contract Documents, provide at no additional cost to Owner.

3.06 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage to be replaced before installation.

2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.

3. Protect bright finished shafts, bearing housings and similar items until in service.

3.07 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

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B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.08 CLEANING

A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.09 START UP

A. Start up equipment, in accordance with manufacturer's start-up instructions and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

1. Do not place equipment in sustained operation prior to initial balancing of HVAC systems.

3.10 PAINTING

A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.

2. After acceptance by Authority Having Jurisdiction (AHJ), In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.

3. See individual equipment Specifications for other painting.

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4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.

5. Piping and Ductwork: Clean, primer coat and paint exposed piping and ductwork on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.

6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

3.11 DEMOLITION

A. Confirm requirements in Division 01, General Requirements and Division 02, Existing Conditions. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Scope:

a. It is the intent of these documents to provide necessary information and adjustments to the HVAC system required to meet code, and accommodate installation of new work.

b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.

c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.

2. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.

3. Unless specifically indicated on Drawings, remove exposed, unused ductwork and piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.

4. Unless specifically indicated on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).

3.12 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

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1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:

    a. Testing and Balancing Reports

    b. Cleaning

    c. Operation and Maintenance Manuals

    d. Training of Operating Personnel

    e. Record Drawings

    f. Warranty and Guaranty Certificates

    g. Start-up/Test Document

    h. Commissioning Reports

3.13 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B. Tests:

1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Operation and Maintenance Manuals.

2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.14 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

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3.15 TEMPORARY HEATING, COOLING AND HUMIDITY CONTROL

A. Provide temporary heating, cooling, controls, humidification and dehumidification as required to facilitate the construction of the project. Size and select temporary system based on the requirements of the various trades during construction. This includes, but is not limited to, drywall, case work, wood flooring and wood finishes that are subject to warping. Size and install system to prevent mold growth. Coordinate the location of the temporary system. The house system can be used. Develop a procedure for how the house system will be used including a sketch depicting the house system, how filtration will be used to prevent construction debris from entering the system and how often the filters will be changed, how the ductwork will be cleaned after use to ensure a clean system is turned over to the Owner and how the units are sized. Submit this procedure to the Mechanical Engineer for review. Follow National Air Duct Cleaners Association (NADCA) duct cleaning procedures and guidelines. Warranties for the house system, if new, to commence when the Owner moves in if house system is used as the means to maintain the climate within the building during construction. Include this warranty requirement in the original bid or proposal amount. Coordinate and provide any temporary power, controls, ductwork, piping, plumbing anchorage, miscellaneous steel and structural supports required to support the temporary system. Installation of the system to comply with all applicable codes and be acceptable to the Authority Having Jurisdiction (AHJ).

END OF SECTION

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SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Hangers and Supports for HVAC Piping, Ductwork and Equipment
2. Wall and Floor Sleeves
3. Building Attachments
4. Flashing
5. Miscellaneous Metal and Materials

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. ASCE 7-16, Minimum Design Loads for Buildings and Other Structures.
2. Terminology: As defined in MSS SP-90 "Guidelines on Terminology for Pipe Hangers and Supports".
3. Install ductwork and piping per SMACNA's requirements.
4. Hanger spacing installation and attachment to meet all manufacturer's requirements and MSS SP-58.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

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1. Welding:

    a. Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

2. Welding for Hangers:

    a. Qualify procedures and personnel according to AWS D9.1, Sheet Metal Welding Code for duct joint and seam welding.

3. Mechanical Contractor Responsibility:

    a. Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, duct support, equipment hangers/supports, support from floor structure, roof structure or from structure above, and seismic restraint by a qualified Structural Professional Engineer.

        1) Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.

4. Manufacturers regularly engaged in the manufacture of bolted metal framing support systems, whose products have been in satisfactory use in similar service for not less than 10 years.

5. Support systems to be supplied by a single manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 PERFORMANCE REQUIREMENTS

A. Provide pipe, ductwork and equipment hangers and supports in accordance with the following:

1. When supports, anchorages, and seismic restraints for equipment, and supports, anchorages, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor is responsible for their design.

2. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Engineered Support Systems:

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1. Support frames such as pipe racks or stanchions for piping, ductwork, and equipment which provide support from below.

2. Equipment, ductwork and piping support frame anchorage to supporting slab or structure.

C. Provide channel support systems, for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

D. Provide heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

E. Obtain approval from AHJ for seismic restraint hanger and support system to be installed for piping and equipment. See Section 23 05 48, Vibration and Seismic Controls for HVAC Equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Hangers and Supports for HVAC Piping, Ductwork and Equipment:

1. Anvil International

2. B-Line Systems, Inc.

3. Erico Company, Inc.

4. Nelson-Olsen Inc.

5. Rilco Manufacturing Company, Inc.

6. Snappitz Thermal Pipe Shield Manufacturing

7. Unistrut Corporation

B. Wall and Floor Sleeves:

1. Thunderline Corporation “Link Seal”

2. Or approved equivalent.

C. Building Attachments:

1. Anchor-It

2. Gunnebo Fastening Corporation

3. Hilti Corporation

4. ITW Ramset/Red Head

5. Masterset Fastening Systems, Inc.

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2.02 HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

A. Hanger Rods: Hanger rods continuously threaded or threaded ends only in concealed spaces and threaded ends only in exposed spaces; finish electro-galvanized or cadmium-plated in concealed spaces and prime painted in exposed spaces; sizes per MSS.

B. Hanger Rod Couplings: Anvil Figure 136, B-Line Figure B3220, or approved equivalent; malleable iron rod coupling with elongated center sight gap for visual inspection; to have same finish as hanger rods.

C. Channel Hanging System:

1. Framing members No. 12 gauge formed steel channels, 1-5/8-inch square, conforming to ASTM A1011 Grade 33, one side of channel to have a continuous slot within turned lips; framing nut with grooves and spring 1/2-inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A307; fittings conforming to ASTM A575; parts enamel painted or electro-galvanized.

2. Concrete Inserts: Malleable iron body, hot dipped galvanized finish. Lateral adjustment. MSS Type 18.

D. Continuous Concrete Insert: Steel construction, minimum 12 gauge. Electrogalvanized finish. Pipe clamps and insert nuts to match.

E. Pipe Hangers:

1. Pipe Rings for Hanger Rods:

a. Pipe Sizes 2-inches and Smaller: Adjustable swivel ring hanger, UL listed. Erico 100 or 101, Anvil Figures 69 or 104, or approved equivalent.

b. Pipe Sizes 2-1/2-inches and Larger: Clevis type hangers with adjustable nuts on rod, UL listed. Anvil figure 260, Erico 400, or approved equivalent.

c. Pipe hangers to have same finish as hanger rods.

F. Pipe Saddles and Shields:

1. Factory fabricated saddles or shields under piping hangers and supports for insulated piping.

2. Size saddles and shields for exact fit to mate with pipe insulation. 1/2 round, 18 gauge, minimum 12-inches in length (4-inch pipe and larger to be three times longer than pipe diameter).

G. Riser Clamps: Steel, UL listed. MSS Type 8. Erico 510 or 511. Copper coated; Erico 368.

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H. Pipe Slides: Anvil, reinforced Teflon slide material (3/32-inch minimum thickness) bonded to steel; highly finished steel or stainless steel contact surfaces to resists corrosion; 60-80 PSI maximum active contact surface loading; steel parts 3/16-inch minimum thickness; attachment to pipe and framing by welding.

I. Pipe Guides:

1. Furnish and install pipe guides on continuous runs where pipe alignment must be maintained. Minimum two on each side of expansion joints, spaced per manufacturer's recommendations for pipe size. Fasten guides securely to pipe and structure. Contact with chilled water pipe not to permit heat to be transferred in sufficient quantity to cause condensation on any surface.

2. Furnish and install guides approximately four pipe diameters (first guide) and 14 diameters (second guide) away from each end of expansion joints. Guides are not to be used as supports and are in addition to other pipe hangers and supports.

J. Pipe Roller Hangers: Adjustable roller hanger. Black steel yoke, cast iron roller. MSS Type 41.

K. Below Ground Pipe Supports:

1. Pipe Hangers All Sizes: Adjustable Clevis type, Federal Specification WW-H-171 (Type 1), UL listed, stainless steel Type 304. MSS Type 1. Erico 406.

2. Rod: 5/8-inch stainless steel Type 18-8.

3. Eyebolt: Stainless steel Type 18-8.

4. Nuts and Washers: Stainless steel Type 18-8.

L. Thermal Hanger Shield Inserts:

1. 100-PSI (690-kPa) minimum compressive strength calcium silicate insulation, encased in sheet metal shield or polyisocyanurate rigid foam exceeding the load bearing weight of the pipe at the hanger point with a PVC vapor barrier.

2. Material for Cold Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with vapor barrier or polyisocyanurate rigid foam with a PVC vapor barrier.

3. Material for Hot Piping: Water-repellent-treated ASTM C533, Type 1 calcium silicate or polyisocyanurate rigid foam with a PVC vapor barrier.

4. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.

5. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.

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6. Insert Length: Extend 2-inches beyond sheet metal shield for piping operating below ambient air temperature.

7. Thermal Hanger Shield Insulation Operating Temperature: Meet or exceed fluid temperature in pipe.

M. Freestanding Roof Supports: Polyethylene high-density UV resistant quick "pipe" block with foam pad.

2.03 WALL AND FLOOR SLEEVES

A. Below Grade or High Water Table Areas:

1. "Link-Seal" Pipe Sleeves: Neoprene gasket links bolted together around an interior sleeve forming a watertight seal.

2. Provide Type S unless otherwise noted.

B. Pre-Engineered Firestop Pipe Penetration Systems: UL listed assemblies for maintaining fire rating of piping penetrations through fire-rated assemblies. Comply with ASTM E814.

C. Fabricated Accessories:

1. Steel Pipe Sleeves: Fabricate from Schedule 40 black or galvanized steel pipe. Remove end burrs by grinding.

2. Sheet Metal Pipe Sleeves: Fabricate from G-90 galvanized sheets closed with lock-seam joints. Provide the following minimum gauges for the sizes indicated:

a. Sleeve Size 4-inches in Diameter and Smaller: 18 gauge.

b. Sleeve Sizes 5-6-inches: 16 gauge.

c. Sleeve Sizes 7-inches and Larger: 14 gauge.

d. Fire-Rated Safing Material.

1) Rockwool Insulation: Complying with FS-HH-I-558, Form A, Class IV, 6 pounds per cubic foot density with melting point of 1985 degrees F and K value of 0.24 at 75 degrees F.

2) Calcium Silicate Insulation: Noncombustible, complying with FS-HH-I-523, Type II, suitable for 100 degrees F to 1200 degrees F service with K value of 0.40 at 150 degrees F.

2.04 BUILDING ATTACHMENTS

A. Beam Clamps:

1. MSS Type 19 and 23, wide throat, with retaining clip.

2. Universal Side Beam Clamp: MSS Type 20.

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B. Powder-Actuated Drive Pin Fasteners: Powder actuated type, drive pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Anchor Bolts:

1. Anchor supports to existing masonry, block and tile walls per anchoring system manufacturer's recommendations or as modified by project structural engineer. Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

2. Anchor Bolts (Cast-In-Place): Steel bolts, ASTM A307. Nuts to conform to ASTM A194. Design values for shear and tension not more than 80 percent of the allowable listed loads.

3. Anchor (Expansion) Bolts: Carbon steel to ASTM A307; nut to conform to ASTM A194; drilled-in type. Design values for shear and tension not more than 80 percent of the allowable listed loads.

4. Anchor (Adhesive) Bolts: Consisting of two-part adhesive cartridge and zinc-plated Type A307 steel anchor bolt rod assembly with ASTM A194 nut.

2.05 FLASHING

A. Steel Flashing: 26 gauge galvanized steel.

B. Safes: 8 mil thick neoprene.

C. Caps: Steel, 22 gauge minimum, 16 gauge at fire-resistant structures.

2.06 MISCELLANEOUS METAL AND MATERIALS

A. General:

1. Provide miscellaneous supports and metal items, including materials, fabrication, fastenings and accessories required for finished installation, where indicated on drawings or otherwise not shown on drawings that are necessary for completion of the project. Contractor is responsible for their design.

2. Fabricate miscellaneous units to size shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

B. Structural Shapes: Where miscellaneous metal items are needed to be fabricated from structural steel shapes and plates, provide members constructed of steel conforming with requirements of ASTM A36 or approved equivalent.

C. Steel Pipe: Provide seamless steel pipe conforming to requirements of ASTM A53, Type S, Grade A, or Grade B. Weight and size required as specified.

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D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items; surface-applied fasteners are specified elsewhere.

E. Bolts: Low carbon steel externally and internally threaded fasteners conforming with requirements of ASTM A307; include necessary nuts and plain hardened washers. For structural steel elements supporting mechanical material or equipment from building structural members or connection thereto, use fasteners conforming to ASTM A325.

F. Miscellaneous Materials: Provide incidental accessory materials, tools, methods, and equipment required for fabrication.

G. Provide hot dipped galvanized components for items exposed to weather. Cold galvanize field-welded joints and components. Use materials compatible with system being supported (i.e. aluminum for aluminum ductwork, stainless steel for stainless steel ductwork).

H. Use straps, threshold rods and wire with sizes required by SMACNA to support ductwork.

I. Grout:

1. ASTM C1107, Grade B, factory mixed and packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.

2. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.

3. Properties: Nonstaining, noncorrosive, and non gaseous.

4. Design Mix: 5000-PSI (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Verify building materials to have hangers and attachments affixed in accordance with hangers to be used. Provide supporting calculations.

B. Examine Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall," "2-Hour Fire/Smoke Barrier," and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.

C. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate proper placement of inserts, anchors and other building structural attachments.

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D. Equipment Clearances: Do not route ductwork, equipment, or piping through electrical rooms, transformer vaults, elevator equipment rooms, IT rooms, MPOE rooms, or other electrical or electronic equipment spaces and enclosures and the like. Within equipment rooms, provide minimum 3-feet lateral clearance from all sides of electric switchgear panels. Do not route ductwork, equipment, or piping above any electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact ductwork, equipment or pipe routing to provide proper clearance with such items.

3.02 HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

A. Hang rectangular sheet-metal ducts with a cross sectional area of less than 7 SF with galvanized strips of No. 16 USS gauge steel 1-inch wide, and larger ducts with steel angles and adjustable hanger rods similar to piping hangers. Support at a maximum of 8-feet on center.

B. Support horizontal ducts within 24-inches of each elbow and within 48-inches of each branch intersection.

C. Design hangers and supports to allow for expansion and contraction.

D. Provide aluminum supports for aluminum ductwork.

E. Provide stainless steel supports for stainless steel ductwork.

F. Support vertical ducts at maximum intervals of 16-feet and at each floor.

G. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

H. Install flexible ductwork per the more stringent of SMACNA HVAC Duct Construction Standards or the following:

1. Support horizontal duct runs at not more than 4 feet intervals.

2. Support vertical risers at not more than 6 feet intervals.

3. Limit sag between support hangers to 1/2-inch per foot of spacing support.

4. Supports shall be rigid and shall be not less than 1.5-inches wide at point of contact with the duct surface.

5. Duct bends shall be not less than 1.5 duct diameter bend radius.

I. Use double nuts and lock washers on threaded rod supports.

J. Floor supports in mechanical rooms to be elevated 1-inch above finish floor and void space filled with masonry grout.

K. Anchor ducts securely to building in such a manner as to prevent transmission of vibration to structure. Do not connect duct hanger straps directly to roof deck. Do not support ducts from other ducts, piping or equipment.

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L. Attach strap hangers installed flush with end of sheet-metal duct run to duct with sheet-metal screws.

M. Construct exterior ductwork or ductwork which is otherwise exposed to weather watertight and slope 1/4-inch per foot to avoid standing water.

N. Exposed ductwork hung in clean areas such as sanitary areas, pharmaceutical areas, wash down areas or food process areas to be installed using double end, food grade trapeze hanger rods suitable for use with food grade strut.

O. Channel Support System Installation:

1. Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

2. Field assemble and install according to manufacturer's written instructions.

P. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

Q. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

R. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

S. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping, ductwork and equipment to proper level and elevations.

T. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.

U. Horizontal Piping Hangers and Supports; Horizontal and Vertical Piping, and Hanger Rod Attachments:

1. Factory fabricated horizontal piping hangers and supports complying with MSS SP-58, to suit piping systems and in accordance with manufacturer's published product information.

2. Use only one type by one manufacturer for each piping service.

3. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping.

4. Pipe support spacing (pipe supported in ceiling or floor-supported) to meet latest applicable Code and manufacturer's requirements.

5. Provide copper-plated hangers and supports for uninsulated copper piping systems.

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V. Plumber's Tape not permitted as pipe hangers or pipe straps.

W. Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure. For horizontally hung grooved-end piping, provide a minimum of 2 hangers per pipe section.

X. Pipe Ring Diameters:

1. Uninsulated and Insulated Pipe, Except Where Oversized Pipe Rings are Specified: Ring inner diameter to suit pipe outer diameter.

2. Insulated Piping Where Oversized Pipe Rings are Specified and Vibration Isolating Sleeves: Ring inner diameter to suit outer diameter of insulation or sleeve.

Y. Oversize Pipe Rings: Provide oversize pipe rings of 2-inch and larger size.

Z. Pipe Support Brackets: Support pipe with pipe slides.

AA. Steel Backing in Walls: Provide steel backing in walls to support fixtures and piping hung from steel stud walls.

BB. Pipe Guides:

1. Install on continuous runs where pipe alignment must be maintained. Minimum two on each side of expansion joints, spaced per manufacturer's recommendations for pipe size. Fasten guides to pipe structure. Contact with chilled water pipe does not permit heat to be transferred in sufficient quantity to cause condensation on any surface.

2. Install approximately four pipe diameters (first guide) and 14 diameters (second guide) away from each end of expansion joints. Do not use as supports. Provide in addition to other required pipe hangers and supports.

CC. Heavy-Duty Steel Trapeze Installation:

1. Arrange for grouping of parallel runs of horizontal piping and support together on field fabricated, heavy-duty trapezes.

2. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

3. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

DD. Group parallel runs of horizontal piping to be supported together on trapeze-type hangers. Maximum spacings: MSS SP-58.

EE. 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.

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FF. Do not support piping from other piping.

GG. Fire protection piping will be supported independently of other piping.

HH. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated.

II. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping" is not exceeded.

JJ. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.

    b. Piping Operating Below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

2. Do not exceed pipe stress limits according to ASME B31.9.

3. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

4. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields to span arc of 180 degrees.

5. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.

6. Shield Dimensions for Pipe, not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN8 to DN 90): 12-inches long and 0.048-inch thick.

    b. NPS 4 (DN100): 12-inches long and 0.06-inch thick.

    c. NPS 5 and NPS 6 (DN125 and DN150): 18-inches long and 0.06-inch thick.

    d. NPS 8 to NPS 14 (DN200 to DN350): 24-inches long and 0.075-inch thick.

    e. NPS 16 to NPS 24 (DN400 to DN600): 24-inches long and 0.105-inch thick.

7. Pipes NPS 8 (DN200) and Larger: Include wood inserts.

    a. Insert Material: Length at least as long as protective shield.

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8. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

KK. Pipe Anchors: Provide anchors to fasten piping which is subject to expansion and contraction, and adjacent to equipment to prevent loading high forces onto the equipment.

LL. Pipe Curb Assemblies:

1. Provide prefabricated units for roof membrane and insulation penetrations related to equipment. Coordinate with roofing system. Set supports on the structural deck. Do not set supports on insulation or roofing. Provide level supports by prefabricated pitch built into the curb.

2. Provide for piping and electrical conduit which penetrates the structural roof deck to service equipment above the roof level (i.e., piping, electrical power and control wiring). Meet requirements of roof warranty.

MM. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor walls, and through equipment room walls and floors.

NN. Vertical Piping:

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

2. Riser clamps to be directly under fitting or welded to pipe.

a. Riser to be supported at each floor of penetration.

b. Provide structural steel supports at the base of pipe risers. Size supports to carry forces exerted by piping system when in operation.

3.03 WALL AND FLOOR SLEEVES

A. "Link-Seal" Pipe Sleeves: Install at floor/below grade piping penetrations. Provide manufacturer's sleeve appropriate to seal type for pre-cast penetrations.

B. Fabricated Pipe Sleeves:

1. Provide either steel or sheet metal pipe sleeves accurately centered around pipe routes. Size such that piping and insulation, if any, will have free movement within the sleeve, including allowance for thermal expansion. Sleeve diameter to be determined by local seismic clearance requirements, and by waterproofing requirements.

2. Length: Equal to thickness of construction penetrated, except extend floor sleeves 1-inch above floor finish.

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3. Provide temporary support of sleeves during placement in concrete and other work around sleeves. Provide temporary end closures to prevent concrete and other materials from entering pipe sleeves.

4. Seal each end airtight with a resilient nonhardening sealer, UL listed, fire rated ASTM 814.

C. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:

1. Install fabricated pipe sleeve.

2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve identification with specified material.

3. Seal each end airtight with a resilient nonhardening UL listed fire resistant ASTM 814.

D. Piping Penetrations Through Fire-Rated (One to Three Hour) Assemblies:

1. Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.

2. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.

3.04 BUILDING ATTACHMENTS

A. Factory fabricated attachments complying with MSS SP-58, selected to suit building substructure conditions and in accordance manufacturer's published product information.

B. Select size of building attachments to suit hanger rods.

C. Space attachments within maximum piping span length indicated in MSS SP-58.

D. Install building attachments within concrete slabs or attach to structural steel or wood. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.

E. Attachment to Wood Structure: Anvil side beam bracket Figure 202 for attachment to wooden beam or approved attachment for a wood structure.

F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Install concrete inserts before concrete is placed; fasten inserts to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.

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H. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Test powder-actuated insert attachments with a minimum load of 100 pounds.

I. Do not use powder-actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4-inches thick.

J. Bolting: Provide bored, drilled or reamed holes for bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.

K. Anchor Bolts:

1. Install anchor bolts for mechanical equipment, piping and ductwork as required. Tightly fit and clamp base-supported equipment anchor bolts at equipment support points. Provide locknuts where equipment, piping and ductwork are hung.

2. Anchor Bolts (Cast-In-Place): Embed anchor bolts in new cast-in-place concrete to anchor equipment. Install a pipe sleeve around the anchor bolt for adjustment of the top 1/3 of the bolt embedment; sizes and patterns to suit the installation conditions of the equipment to be anchored.

3.05 FLASHING

A. Flash and counterflash where piping, ductwork and equipment passes through weather or waterproofed walls, floors, and roofs.

B. Provide 12-inch minimum height curbs for roof-mounted mechanical equipment. Flash and counter flash with galvanized steel, soldered and waterproofed.

3.06 MISCELLANEOUS METAL AND MATERIALS

A. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other connection devices required. Include anchorages; clip angles, sleeves, anchor plates, and similar devices. Hot dipped galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.

B. Finishes:

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1. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with 1 coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas in primer with same material, before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.

2. Metal in Contact with Concrete, Masonry and Other Dissimilar Materials: Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.

3. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

C. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required. Avoid cutting concrete reinforcing when drilling for inserts. Reference structural drawings and reinforcing shop drawings and determine locations of stirrups prior to drilling into concrete.

E. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items, which are to be built into concrete masonry or similar construction.

F. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

G. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

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H. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

I. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

J. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

K. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

L. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

M. Provide galvanized components for items exposed to weather.

3.07 FIRE RATED SUPPORTS

A. Provide fire rated support as required by Codes.

END OF SECTION

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SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. General Requirements and Procedures
2. Ductwork Pressure Testing
3. Fundamental Air Systems Balancing Procedures
4. Temperature Control Verification
5. Constant Volume Air Systems Balancing Procedures
6. Pre-Balance Reporting
7. Final Reports:
    a. Report Requirements
    b. General Report Data
    c. System Diagrams
    d. Air Handling Units
    e. Fans
    f. Duct Traverses
    g. Diffusers/Registers/Grilles
    h. Instrument Calibration
8. Additional Tests

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

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1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Quality-Assurance Submittals: Submit two copies of evidence that the Testing, Adjusting, and Balancing (TAB) Agent and Project's TAB team members meet the qualifications specified in the "Quality Assurance" Article below.

2. Pre-Construction Phase Report:

a. Provide a pre-construction phase TAB Plan at least two weeks prior to the commencement of TAB work. This report is to include:

1) A complete set of report forms intended for use on the Project, with data filled in except for the field readings. Forms to be Project-specific.

2) Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.

3) Identification of the type, manufacturer, and model of the actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certifications to be included.

4) A narrative of Project-specific and/or non-standard TAB procedures to be used, and the equipment or systems to which they apply.

3. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit two copies of the Contract Documents review report as specified in Part 3 of this Section.

4. Strategies and Procedures Plan: Submit two copies of the TAB strategies and step-by-step procedures as specified in Part 3 of this Section. Include a complete set of report forms intended for use on this Project.

5. Specify reports required because of editing procedures in Part 3 of this Section.

6. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by the TAB Agent.

7. Sample Report Forms: Submit two sets of sample TAB report forms.

8. Test Instrument Calibration: Submit proof of calibration within the last 6 months.

9. Final Report.

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10. Provide additional submittals to commissioning authority as dictated in Commissioning Specifications.

1.05 QUALITY ASSURANCE

A. Quality Assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Balance Firm Qualifications:

a. General:

1) Procure services of independent TAB agency to balance, adjust and test water circulating and air moving equipment and air distribution or exhaust systems. Minimum experience: 5 years.

2) Provide proof of testing agency having successfully completed at least five projects of similar size and scope.

b. Testing and Balancing firm is certified by NEBB or AABC and has a NEBB Certified Professional (CP) or a AABC Test and Balancer Engineer (TBE) on staff.

c. Industry Standards: Testing and Balancing will conform to NEBB or AABC, and American National Standards Institute (ANSI) as follows:

1) NEBB: Comply with Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

2) AABC: Comply with National Standards for Total System Balance.

3) ANSI:

(a) S1.4 Specifications for sound level meters.

(b) S1.11 Specifications for Octave-Band and Fractional-Octave-Band analog and digital filters.

(c) ANSI S1.13 Methods for the Measurement of Sound Pressure Levels.

d. Test Observation: If requested, conduct tests in the presence of the Commissioning Authority, AHJ, Architect or the Architect's representative.

2. Noise Criteria:

a. Noise levels in all 8 octave bands due to equipment and duct systems are not to exceed the following NC levels:

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TYPE OF ROOM	NC LEVEL
Bathrooms and Toilet Rooms	35-40
Conference Room	30-35
Corridors (Public)	35-40
Lobbies, Waiting Areas	35-40
Offices, Large Open (3 or more occupants)	35-40
Offices, Small Private (2 or fewer occupants)	30-35
Kitchens	40-45
Classrooms (Small, Medium, Large)	30-35
Cafeteria/Dining	35-40
All Others	35-40

b. An allowance, not to exceed 5db, may be added to the measured value to compensate for the variation of the room attenuating effect between room test condition prior to occupancy and design condition after occupancy which may include the addition of sound absorbing material, such as furniture. This allowance may not be taken after occupancy. The room attenuating effect is defined as the difference between sound power level emitted to room and sound pressure level in room.

c. In absence of specified measurement requirements, measure equipment noise levels three feet from equipment and at an elevation of maximum noise generation.

3. Code Compliance: Perform tests in the presence of the Authority Having Jurisdiction (AHJ) where required by the Authority Having Jurisdiction (AHJ).

4. Owner Witness: Perform tests in the presence of the Commissioning Authority, Architect, Architect's Representative, or Owner's representative.

5. Engineer Witness: The engineer or engineer's representative reserves the right to observe tests or selected tests to assure compliance with the specifications.

6. Simultaneous Testing: Test observations by the AHJ, the Owner's Authorized Representative and the engineer's representative need not occur simultaneously.

7. Do not perform TAB work until heating, ventilating, and air conditioning equipment has been completely installed and is operating continuously as required.

8. Conduct air testing and balancing with clean filters in place. Clean strainers prior to performing hydronic testing and balancing.

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9. TAB Conference: Meet with the Commissioning Authority, Owner's and the Architect's representatives on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days advance notice of scheduled meeting time and location.

    a. Agenda Items: Include at least the following:

        1) Submittal distribution requirements.

        2) Contract Documents examination report.

        3) TAB plan.

        4) Work schedule and Project site access requirements.

        5) Coordination and cooperation of trades and subcontractors.

        6) Coordination of documentation and communication flow.

10. Certification of TAB Reports: This certification includes the following:

    a. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

    b. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

11. TAB Reports: Use standard forms from NEBB or AABC.

12. Instrumentation Type, Quantity, and Accuracy: As described in NEBB or AABC.

13. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. TAB Agency provides warranty for a period of 90 days following submission of completed report, during which time, Owner may request a recheck of up to 10 percent of total number of terminals, or resetting of outlet, coil, or device listed in the final TAB report.

2. Guarantee: Meet the requirements of the following programs:

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a. Provide a guarantee on NEBB or AABC forms stating that the agency will assist in completing the requirements of the Contract Documents if the TAB Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1) The certified Agent has tested, adjusted, and balanced systems according to the Contract Documents.

2) Systems are balanced to optimum performance capabilities within design and installation limits.

1.07 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. TAB: Testing, Adjusting, and Balancing.

K. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

L. Test: A procedure to determine quantitative performance of a system or equipment.

M. Testing, Adjusting, and Balancing (TAB) Agent: The entity responsible for performing and reporting the TAB procedures.

N. AABC: Associated Air Balance Council.

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O. NEBB: National Environmental Balancing Bureau.

P. AMCA: Air Movement and Control Association.

Q. CTI: Cooling Tower Institute.

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

1.08 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide 7 days advance notice for each test. Include scheduled test dates and times.

C. Witness leakage and pressure tests carried out by Section 23 31 00, HVAC Ducts and Casings.

D. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS AND PROCEDURES

A. Project Conditions:

1. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire TAB period. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.

2. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during TAB operations to minimize conflicts with the Owner's operations.

3. Non-Owner Occupancy: Complete balancing of building systems prior to Substantial Completion and owner occupancy.

B. General Requirements:

1. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and controls, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.

2. Perform TAB work with doors, closed windows, and ceilings installed etc., to obtain simulated or project operating conditions. Do not proceed until systems scheduled for TAB are clean and free from debris, dirt and discarded building materials.

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3. Where Owner occupies building during the testing period, cooperate with Owner to minimize conflicts with Owner's operations.

C. Examination:

1. Examine Contract Documents to become familiar with project requirements and existing building record documents (if available) to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

   a. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

   b. Verify that balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

2. Examine approved submittal data of HVAC systems and equipment.

3. Examine Project record documents described in Division 01, General Requirements.

4. Examine Architect's and Engineer's design data, including Basis of Design, HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

5. Examine equipment performance data, including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

6. Coordinate requirements in system and equipment with this Section.

7. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

8. Examine system and equipment test reports.

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9. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

10. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

11. Examine equipment for installation and for properly operating safety interlocks and controls.

12. Report deficiencies discovered before and during performance of TAB procedures.

D. Preparation:

1. Prepare a TAB plan that includes strategies and step-by-step procedures.

2. Complete system readiness checks and prepare system readiness reports. Verify the following:

a. Permanent electrical power wiring is complete.

b. Automatic temperature-control systems are operational.

c. Equipment and duct access doors are securely closed.

d. Balance, smoke, and fire dampers are open.

e. Isolating and balancing valves are open and control valves are operational.

f. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

g. Windows, doors and other portions of the building envelope can be closed so design conditions for system operations can be met.

3. Hold a pre-balancing meeting at least one week prior to starting TAB work.

a. Attendance is required by installers whose work will be tested, adjusted, or balanced.

4. Provide instruments required for TAB operations. Make instruments available to Architect to facilitate spot checks during testing.

E. General TAB Procedures:

1. Perform TAB procedures on each system according to the procedures contained in NEBB or AABC and this Section.

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2. Coordinate location of test probes prior to start of TAB procedures and make test probes available for Owner's tests after start of occupancy. Where required, cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

3. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

F. Adjustment Tolerances:

1. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.

2. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3. Hydronic Systems: Adjust to within plus or minus 10 percent of design at coils and plus or minus 5 percent at system pumps and equipment.

4. Adjust supply, return, and exhaust air quantities to maintain pressurization in spaces indicated on Drawings. Note and document room-to-room pressurization and maintain these relationships. Adjust pressure controlled spaces to within plus or minus 0.01 in WC.

G. Recording and Adjusting:

1. Field Logs: Maintain written logs including:

   a. Running log of events and issues.

   b. Discrepancies, deficient or uncompleted work by others.

   c. Contract interpretation requests.

   d. Lists of completed tests.

2. Ensure recorded data represents actual measured or observed conditions.

3. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

4. Mark on drawings locations where traverse and other critical measurements were taken and cross reference location in final report.

5. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

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6. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

7. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner's Authorized Representative, or Commissioning Agent.

3.02 DUCTWORK PRESSURE TESTING

A. Test ductwork prior to connection to fan equipment. Repair leaks and retest until stipulated results are achieved.

B. Provide air pressure testing of ductwork as noted below for various project types and systems:

1. Supply and return ductwork located inside shafts and outside building envelope.

2. Exhaust ductwork located outside building envelope, when used in a heat recovery system.

3. For other project types or systems: pressure test ductwork in accordance with SMACNA HVAC Air Duct Leakage Test Manual, of representative sections of installed ductwork totaling not less than the total installed duct areas noted below:

a. For variable air volume supply, return, or exhaust air systems' ductwork of higher than 2-inches pressure class: pressure test 40 percent of the total installed duct area.

b. For variable air volume supply, return, or exhaust air systems' ductwork of 2-inches or less pressure class: pressure test ductwork connected to 10-percent of the total installed duct area of such ductwork, but not less than ductwork connected to two terminal units. Where the tested 10-percent fails to comply, then pressure test 40-percent of the total installed duct area.

c. For constant air volume supply, return, or exhaust systems: pressure test 40-percent of the total installed duct area.

4. Where tests are required, provide separate tests for each of supply, return and exhaust air systems.

5. Where the tested 40-percent fails to comply with the requirements of this section, then pressure test 100-percent of the total installed duct area. Sections shall be selected by the building owner or the Architect and shall include sections of ductwork upstream and downstream of terminal units. Positive pressure leakage testing may be utilized for negative pressure ductwork.

6. Area requirement of 40-percent of the total installed duct area is inclusive of ductwork located in shafts or outside building envelope.

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C. Test ductwork prior to connection to fan equipment. Repair leaks and retest until stipulated results are achieved. Pressure testing to meet the following leakage classifications below as a minimum (2012 SMACNA HVAC Air Duct Leakage Manual, Table 4-1):

1. Leakage class to be as defined below as a minimum.

   a. Minimum Duct Leakage Classification

Duct Type	Leakage Class
Metal (Flexible excluded)	
Round and flat oval	3
Rectangular	6

2. Testing machine: Meet requirements of SMACNA standards. Pacific Air Products "Port-O-Lab", Rolok, or United Sheet Metal.

3. Test supply systems prior to connecting terminal units.

4. Perform tests in presence of Owner's Authorized Representative. Give 48 hours advance notice before commencement of each test.

5. Test ductwork systems in sections as large as possible and record test results accordingly.

6. Leak test grease exhaust ductwork per requirements of latest edition of NFPA-96 and local Mechanical Code.

7. Coordinate testing with ceiling installation.

   a. Provide sheet-metal plates and install between each duct test section (applies to main-to-main fittings, branch-to-branch fittings and main-to-branch fittings). At each plate location, fabricate joint with Ductmate. Insert 14 gauge sheet metal between Ductmate using a neoprene gasket on both sides of metal plate.

   b. Leave plates in place until isolated section has been tested and approved by Owner's Authorized Representative.

   c. Once sections have passed test, remove plates and reattach Ductmate joints. After fan unit is running, test joint for leakage by using a mixture of soap and water. If noise or bubbling occurs, reseal joint. Owner's Authorized Representative to witness this procedure.

8. Test duct at 1.5 times the design air pressure, up to pressure class of the duct. Seal audible leaks.

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3.03 FUNDAMENTAL AIR SYSTEMS BALANCING PROCEDURES

A. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

B. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

C. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

D. Prepare test reports for both fans and inlets and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan volumes.

E. Prepare schematic diagrams of systems' "as-built" duct layouts.

F. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

G. Check the airflow patterns from the outside-air louvers and dampers and the return-air and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

H. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

I. Verify that motor starters are equipped with thermal protection, sized for the connected load.

J. Check dampers for proper position to achieve desired airflow path.

K. Check for airflow blockages.

L. Check that condensate drains are installed, trapped and primed and routed to drain.

M. Check for readily observable leaks in air-handling unit components and ductwork.

N. Use sheaves and pulleys to adjust the speed of belt drive fans to achieve design flow with motors running at 60 Hertz unless noted otherwise.

3.04 TEMPERATURE CONTROL VERIFICATION

A. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.

2. Dampers and valves are in the position indicated by the controller.

3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.

4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.

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5. Thermostats and humidistats are located to avoid adverse effects of sunlight, equipment, drafts, and cold walls.

6. Sensors are located to sense only the intended conditions.

7. Sequence of operation for control modes is according to the Contract Documents.

8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

9. Interlocked systems are operating.

10. Changeover from heating to cooling mode occurs according to design values.

B. Verify that controllers are calibrated and commissioned.

C. Check transmitter and controller locations and note conditions that would adversely affect control functions.

D. Record controller settings and note variances between set points and actual measurements.

E. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

F. Verify free travel and proper operation of control devices such as damper and valve operators.

G. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

H. Confirm interaction of electrically operated switch transducers.

I. Confirm interaction of interlock and lockout systems.

J. Verify main control supply-air pressure and observe compressor and dryer operations.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.05 CONSTANT VOLUME AIR SYSTEMS BALANCING PROCEDURES

A. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer. Adjust fans to deliver design airflow at the lowest possible speed.

1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.

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b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each air-handling unit component under final balanced condition.

3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Recommend corrective action to align design and actual conditions.

4. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.

5. Do not make fan-speed adjustments that result in motor loading greater than full load amps. Do not increase fan speed beyond fan class rating. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

6. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

7. Calibrate airflow measuring stations.

3.06 PRE-BALANCE REPORTING

A. Pre-Construction Phase Report:

1. Provide a pre-construction phase TAB Plan at least 2 weeks prior to the commencement of TAB work. This report is to include:

a. A complete set of report forms intended for use on the Project, with all data filled in except for the field readings. Forms to be Project-specific.

b. Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.

c. Identification of the type, manufacturer, and model of actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certifications are to be included.

d. A narrative of Project-specific and/or non-standard TAB procedures to be used, and the equipment or systems they apply to.

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B. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

C. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced.

3.07 FINAL REPORTS

A. Report Requirements:

1. General:

a. Computer generated in PDF format and tabulated, divided, and bookmarked into sections by tested and balanced systems.

b. Include a certification sheet in front of binder signed and sealed by the certified TAB engineer.

1) Include a list of the instruments used for procedures, along with proof of calibration.

c. Final Report Contents: In addition to the certified field report data, include the following:

1) Pump curves

2) Fan Curves

3) Manufacturers Test Data

4) Field test reports prepared by system and equipment installers

5) Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data

B. General Report Data:

1. In addition to the form titles and entries, include the following data in the final report, as applicable:

a. Title Page

b. Name and Address of TAB Agent

c. Project Name

d. Project Location

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e. Architect's Name and Address

f. Engineer's Name and Address

g. Contractor's Name and Address

h. Report Date

i. Signature of TAB Agent who Certifies the Report

j. Summary of Contents, Including the Following:

1) Design versus Final Performance

2) Notable Characteristics of Systems

3) Description of System Operation Sequence if it varies from the Contract Documents

k. Nomenclature Sheets for Each Item of Equipment

l. Data for Terminal Units, including Manufacturer, Type Size, and Fittings

m. Notes to explain why certain final data in the body of reports vary from design values.

n. Test Conditions for Fans and Pump Performance Forms, Including the Following:

1) Settings for Outside-, Return-, and Exhaust-Air Dampers

2) Conditions of Filters

3) Cooling Coil, Wet- and Dry-bulb Conditions

4) Face and Bypass Damper Settings at Coils

5) Fan Drive Settings, including Settings and Percentage of Maximum Pitch Diameter

6) Inlet Vane Settings for Variable-Air-Volume Systems

7) Settings for Supply-air, Static-pressure Controller

8) Other System Operating Conditions that affect Performance

C. System Diagrams:

1. Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:

a. Quantities of Outside, Supply, Return, and Exhaust Airflows

b. Water and Steam Flow Rates

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c. Duct, Outlet, and Inlet Sizes

d. Pipe and Valve Sizes and Locations

e. Terminal Units

f. Balancing Stations

D. Air Handling Units:

1. For air-handling units, split systems, fan coils, pumps, and evaporator units with coils, include the following:

a. Unit Data: Include the following:

1) Unit Identification

2) Location

3) Make and Type

4) Model Number and Unit Size

5) Manufacturer's Serial Number

6) Unit Arrangement and Class

7) Discharge Arrangement

8) Sheave Make, Size in inches, and Bore

9) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches

10) Number of Belts, Make, and Size

11) Number of Filters, Type, and Size

b. Motor Data: Include the following:

1) Make and Frame Type and Size

2) Horsepower and rpm

3) Volts, Phase, and Hertz

4) Full-load Amperage and Service Factor

5) Sheave Make, Size in Inches, and Bore

6) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches

c. Test Data: Include design and actual values for the following:

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1) Total Airflow Rate in cfm (L/s)

2) Total System Static Pressure in Inches wg (Pa)

3) Fan rpm

4) Discharge Static Pressure in Inches wg (Pa)

5) Filter Static-pressure Differential in Inches wg (Pa)

6) Preheat Coil Static-pressure Differential in Inches wg (Pa)

7) Cooling Coil Static-pressure Differential in Inches wg (Pa)

8) Heating Coil Static-pressure Differential in Inches wg (Pa)

9) Outside Airflow in cfm (L/s)

10) Return Airflow in cfm (L/s)

11) Outside-air Damper Position

12) Return-air Damper Position

13) Vortex Damper Position

E. Fans:

1. Fan Test Reports: For supply, return, and exhaust fans, include the following:

a. Fan Data: Include the following:

1) System Identification

2) Location

3) Make and Type

4) Model Number and Size

5) Manufacturer's Serial Number

6) Arrangement and Class

7) Sheave Make, Size in Inches, and Bore

8) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches

b. Motor Data: Include the following:

1) Make and Frame Type and Size

2) Horsepower and rpm

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3) Volts, Phase, and Hertz

4) Full-load Amperage and Service Factor

5) Sheave Make, Size in Inches, and Bore

6) Sheave Dimensions, Center-to-center and Amount of Adjustments in Inches

7) Number of Belts, Make, and Size

c. Test Data: Include design and actual values for the following:

1) Total Airflow Rate in cfm

2) Total System Static Pressure in Inches wg

3) Fan rpm

4) Discharge Static Pressure in Inches wg

5) Suction Static Pressure in Inches wg

F. Duct Traverses:

1. Include a diagram with a grid representing the duct cross-section and record the following:

a. Report Data: Include the following:

1) System and Air-handling Unit Number

2) Location and Zone

3) Duct Static Pressure in Inches wg

4) Duct Size in Inches

5) Duct Area in SF

6) Design Airflow Rate in cfm

7) Design Velocity in fpm

8) Actual Airflow Rate in cfm

9) Actual Average Velocity in fpm

G. Diffusers/Registers/Grilles:

1. For diffusers, registers and grilles, include the following:

a. Unit Data: Include the following:

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1) System and Air-handling Unit Identification

2) Location and Zone

3) Test Apparatus Used

4) Area Served

5) Air-terminal-device Make

6) Air-terminal-device Number from System Diagram

7) Air-terminal-device Type and Model Number

8) Air-terminal-device Size

9) Air-terminal-device Effective Area in SF

b. Test Data: Include design and actual values for the following:

1) Airflow Rate in cfm

2) Air Velocity in fpm

3) Final Airflow Rate in cfm

4) Final Velocity in fpm

5) Space Temperature in Degrees F

H. Instrument Calibration:

1. For instrument calibration, include the following:

a. Report Data: Include the following:

1) Instrument Type and Make

2) Serial Number

3) Application

4) Dates of Use

b. Dates of Calibration

3.08 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

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END OF SECTION

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SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Ductwork, Joints, and Fittings
2. Insulated Flexible Duct
3. Drain Pans
4. Ductwork Joint Sealers and Sealants

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Section 23 05 29, Hangers and Supports for HVAC Piping, Ductwork and Equipment.
2. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Welding Certificates.
2. Field Quality Control Reports.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. NFPA Compliance:

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a. NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

b. NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

2. Comply with NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations, Ch. 3, Duct System for range hood ducts, unless otherwise indicated.

3. Comply with SMACNA's HVAC Duct Construction Standards - Metal and Flexible for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Provide sheet metal materials free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

4. Provide ductwork pressure testing and leakage testing per Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and distribution equipment and other air system components. Duct design is generally diagrammatic and is not meant to be scaled. Major changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

PART 2 - PRODUCTS

2.01 DUCTWORK, JOINTS, AND FITTINGS

A. Materials:

1. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, lock-forming quality, ASTM A 653/A 653M FS Type B, with G90/Z275 coating, minimum 26 gauge except where heavier material is specified. Ducts to have mill phosphatized finish for surfaces exposed to view.

2. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Minimum 24 gauge except where heavier matieral is specified; alloy 6061-T651 or of equivalent strength with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts with liquid-tight joints when containing condensate vapor or liquids in suspension.

3. Stainless Steel: Fabricated in accordance with ASTM A167 and A480 with liquid-tight joints when containing condensate vapor or liquids in suspension.

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B. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.

2. Deflection: Duct systems not-to-exceed deflection limits according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.

3. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

C. Formed-On Flanges: construct according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Duct Size: Maximum 30-inches wide and up to 2-inch wg pressure class.

2. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

3. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19-inches and larger and 0.0359-inch thick or less, with more than 10 SF of nonbraced panel area unless ducts are lined.

D. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of material specified in this Section according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.

1. Ducts up to 20-inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.

2. Ducts 21- to 72-inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.

3. Ducts Larger than 72-inches in Diameter: Companion angle flanged joints per SMACNA HVAC Duct Construction Standards-Metal and Flexible, Figure 3-2.

4. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.

E. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's HVAC Duct Construction Standards-Metal and Flexible, with metal thicknesses specified for longitudinal-seam straight ducts.

F. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

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G. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows to be 1.5 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's HVAC Duct Construction Standards-Metal and flexible, unless otherwise indicated.

2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):

   a. Ducts 3- to 36-inches in Diameter: 0.034-inch.

   b. Ducts 37- to 50-inches in Diameter: 0.040-inch.

   c. Ducts 52- to 60-inches in Diameter: 0.052-inch.

   d. Ducts 62- to 84-inches in Diameter: 0.064-inch.

3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:

   a. Ducts 3- to 26-inches in Diameter: 0.034-inch.

   b. Ducts 27- to 50-inches in Diameter: 0.040-inch.

   c. Ducts 52- to 60-inches in Diameter: 0.052-inch.

   d. Ducts 62- to 84-inches in Diameter: 0.064-inch.

4. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.

5. Round Elbows:

   a. 8-inches and Less in Diameter: Fabricate die-formed elbows for 45 and 90-degree elbows and pleated elbows for 30, 45, 60 and 90 degrees only. Fabricate nonstandard bend-angle configurations or non-standard diameter elbows with gored construction.

   b. 9 through 14-inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60 and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

   c. Larger than 14-inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.

6. Die-Formed Elbows for Sizes through 8-inches in Diameter and Pressures 0.040-inch thick with two-piece welded construction.

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7. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.

8. Pleated Elbows for Sizes through 14-inches in Diameter and Pressures through 10-inch wg (2500 Pa): 0.022-inch.

9. Not acceptable:

   a. Corrugated or flexible metal duct.

   b. Adjustable elbows.

2.02 INSULATED FLEXIBLE DUCT

A. Manufacturers:

1. ATCO

2. Flexmaster

3. J.P. Lamborn Co.

4. Hart and Cooley

B. Construction: Standard factory fabricated product. Inner wall: Impervious vinyl or chlorinated polyethylene, permanently bonded to a vinyl or zinc-coated spring steel helix.

C. Insulation: Fiberglass blanket insulation covered by an outer wall of vinyl or fiberglass-reinforced metalized vapor barrier.

D. Listing: UL 181 listed Class 1 flexible air duct material. Overall thermal transmission: No more than 0.25 BTU/in or hr/sq. degrees F at 75 degrees F differential, per ASTM C335.

E. Vapor transmission value no more than 0.10 perm, per ASTM E96.

F. Pressure Rating: 4-inch wg positive pressure and 1-inch wg negative pressure.

G. Performance Air Friction Correction Factor: 1.3 maximum at 95 percent extension. Working air velocity: Minimum 2000 FPM.

H. Flame Spread Rating: No more than 25.

I. Smoke Development Rating: No more than 50 as tested per ASTM E84.

J. Insertion Loss: Minimum attenuation of 29 DB for 10-foot straight length at 8-inch diameter at 500 Hz.

2.03 DRAIN PANS

A. Primary Drain Pans: Stainless Steel, fabricated in accordance with ASTM A167 and A480.

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B. Secondary Drain Pans: Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G90/Z275 coating.

2.04 DUCTWORK JOINT SEALERS AND SEALANTS

A. Manufacturers:

1. Ductmate
2. Duro Dyne
3. Hardcast
4. United McGill Corporation
5. Vulkem
6. Foster
7. Childer
8. Design Polymetrics (DP)

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

C. Low Emitting Materials Requirement: Adhesives, sealants and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168.

D. Type: Heavy mastic or liquid, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure and leakage class of ducts.

E. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.

F. Water Based Sealant for Brush-On Application: Flexible, adhesive sealant, resistant to UV light, UL-181A, and UL-181-B listed, complying with NFPA requirements for Class 1 ducts. Min. 69 percent solids, nonflammable. Hardcast Versa-Grip 181; Childers CP-146; Foster 32-19 for SMACNA 1/2, 1, 2, 3, 4, 6, and 10-inch WG duct classes, and SMACNA Seal Class A, B, or C.

G. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

H. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

I. Polyurethane Sealant: General-purpose, exterior use, non-brittle sealant for gunned application. Vulkem 616 or equal.

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PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. General: Use the following pressure seal, and leakage class(es) in design of ductwork specified in this section unless otherwise noted on Drawings.

SYSTEM	PRESSURE CLASS (Inches of Water)	SEAL CLASS	LEAKAGE CLASS ROUND DUCTS	LEAKAGE CLASS RECTANGULAR DUCTS
Medium Pressure Supply (fan to terminal unit)	0.5-inch higher than air handlers discharge pressure (min 4-inch pressure class).	A	2	4
Low Pressure (downstream of terminal unit)	+ 1-inch	A	2	4
Return and Exhaust	0.5-inch more negative than return/exhaust fan pressure or -2-inch pressure class, whichever is more negative.	A	2	4
Kitchen Grease Exhaust	-6-inch	N/A	N/A	N/A
Lab Medium Pressure Exhaust (lab valve / terminal unit to fan)	-6-inch	A	2	4
Lab Low Pressure Exhaust (upstream of lab valve / terminal unit)	-1-inch	A	2	4
Hazardous Exhaust	-6-inch	A	2	4

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Ductwork used in Smoke Management Systems	-6-inch or 1.5 times max design pressure, if more negative than -6-inch	A	2 (up to max 5-percent leakage)	4 (up to max 5-percent leakage)
Cryogen Relief Vent	+10-inch	N/A	N/A	N/A

B. Ductwork Installation:

1. General: Install entire duct system in accordance with drawings, Specifications, and latest issues of local Mechanical Code, NFPA 90A, and SMACNA Duct Construction Manual. At Contractor's option, rectangular ductwork may be resized to maintain an equivalent air velocity and friction rate, while maintaining a maximum aspect ratio of 3. Remove markings and tagging from ductwork exterior surface in mechanical rooms and other locations where ductwork is exposed.

2. The duct layout shown on the Contract Drawings is diagrammatic in nature. Coordinate the ductwork routing and layout, and make alterations to the ductwork routing and layout to eliminate physical interferences. Where deviations in the ductwork routing as shown in the Contract Drawings are required, alterations may be made so as not to compromise the air flow, pressure drop, and sound characteristics of the duct fitting or duct run as shown on the Contract Drawings. In the event Architect determines that the installed ductwork is inconsistent with the above mentioned criteria, remove and replace at no additional cost to the Owner.

3. Install ducts with fewest possible joints.

4. Install fabricated fittings for changes in directions, size, shape, and for connections.

5. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12-inches, with a minimum of 3 screws in each coupling.

6. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

7. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

8. Install ducts with a clearance of 1-inch, plus allowance for insulation thickness. Allow for easy removal of ceiling tile.

9. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

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10. Coordinate layout with suspended ceiling, air duct accessories, lighting layouts, and similar finish work.

11. Electrical and IT Equipment Spaces: Route ducts to avoid passing through transformer vaults, electrical equipment spaces, IDF/MPOE rooms, and enclosures.

12. Boiler Rooms and Refrigeration Machinery Rooms: Only route ducts serving these rooms through these rooms.

13. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2-inches.

14. Fire- and Smoke-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire, smoke or combination fire and smoke dampers as governed by Building Code and AHJ, including sleeves, and firestopping sealant.

15. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Reference SMACNA's Seismic Restraint Manual: Guidelines for Mechanical Systems, Mason Seismic Restraint and Support Systems.

16. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's Duct Cleanliness for New Construction Advanced Level.

17. Paint interiors of metal ducts, that do not have duct liner, for 24-inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible duct material.

18. Install ductwork in the location and manner shown and detailed. Review deviations required by job conditions with Architect prior to any fabrication. Provide fittings for construction per SMACNA.

19. Install flexible ductwork to limit sag between support hangers to 1/2-inch per foot of spacing support.

C. Flanged Take-Offs:

1. Install at branch takeoffs to outlets using round or flex duct.

2. Flanged take-offs secured with minimum 8-inch screw spacing (three screws minimum).

3. Provide ductwork taps and branches off of main ducts at 45 degrees whether shown on Drawings or not (drawings are diagrammatic).

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D. Cleaning:

1. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

2. Grille and Exposed Duct Cleaning:

a. After completion of ductwork installation, operate each fan system (excluding exhaust fans) for a minimum of 30 minutes prior to installation of ceiling grilles and diffusers. After grilles and diffusers are installed, clean out accumulation of particles from grilles and diffusers prior to acceptance.

b. Clean exterior surface of ducts exposed to public view of chalk, pencil and pen marks, labels, sizing tags, dirt, dust, etc., so that upon completion of installation, ducts are left in clean and unblemished manufactured conditions.

c. Exposed duct and grilles to remain free of dust entrained streaks due to leakage at joints and grille connections during warranty period. Clean leaks, seal and refinish to match existing if visible streaks develop.

3.02 DUCTWORK, JOINTS, AND FITTINGS INSTALLATION

A. Duct Materials - Applied Locations:

1. General: Use the following materials in design of ductwork specified in this Section unless otherwise noted on the Drawings.

Location or Application	Material
Supply, Return, Transfer, and Exhaust - Low Pressure (downstream of terminal units)	Single Wall, Galvanized Steel
Supply, Return, and Exhaust - Medium Pressure (upstream of terminal units)	Single Wall, Galvanized Steel
General Exhaust Branch Serving Air Inlet in Shower Room or Toilet Room with Shower	Single Wall, Aluminum or Type 304 Stainless Steel
Supply, Return, Exhaust serving Natatorium, Pool, or Spa Area	Single Wall, Aluminum or Type 304 Stainless Steel
Fume Hood Exhaust	Single Wall, Type 316 Stainless Steel
Ductwork for the First 15-feet Downstream of Humidifier	Single Wall, Type 316 Stainless Steel

B. Ductwork Installation:

1. Fabricate radius elbows with centerline radius not less than 1-1/2 duct diameters.

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2. Do not install duct size transition pitch angles which exceed 30 degrees for reductions in duct size in the direction of airflow, and 15 degrees for expansions in duct size in the direction of airflow.

3. Install fixed turning vanes in square throat rectangular elbows and in tees.

4. Fabricate duct turns with the inside (smallest) radius at least equal to the duct width (supply ducts) and 1.5 times radius (return and exhaust ducts). Where necessary, square elbows may be used, with maximum available inside radius and with fixed turning vanes. In healthcare settings such as hospitals and medical office buildings, square elbows and turning vanes allowed on supply ductwork only.

3.03 INSULATED FLEXIBLE DUCT INSTALLATION

A. Provide sheet metal plenum or rigid elbow and connect to diffusers and grilles with ductwork connections. Refer to Drawings for more information. Provide straight section of flexible duct with minimum length of 2-feet and maximum length of 5-feet and connect to sheet metal plenums and rigid elbows connected to diffusers and grilles, unless noted otherwise.

1. Provide round neck grilles/diffusers or square-to-round transitions. Flexible duct connections directly to diffuser and grilles is not allowed.

2. Flexible duct allowed in concealed spaces above lay-in ceilings only.

3.04 DRAIN PANS INSTALLATION

A. Install where shown on Drawings. Drain provided by Division 22, Plumbing. Provide drain (sized per code) connection from each drain pan and pipe to nearest floor drain through trap and 10-inch air gap. Drain pans over 6-feet in length require drain connections from both ends. Pitch drain pans in direction of air flow and to drain. Support secondary drain pan independently from equipment.

3.05 DUCTWORK JOINT SEALERS AND SEALANTS INSTALLATION

A. Joints and Seam Joint Sealing:

1. Seal duct seams and joints according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, for duct pressure class indicated.

2. Seal transverse joints, longitudinal seams and duct wall penetrations including screw, fastener, pipe, rod, and wire.

3. Seal ducts before external insulation is applied.

4. Tape joints of PVC coated metal ductwork with PVC tape.

5. Fasteners such as sheet-metal screws, machine screws or rivets to be cadmium plated.

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6. Rectangular Ductwork: Where intermediate joint reinforcement is required for duct of negative pressure class, pre-drill stiffening flange and provide fastener maximum 8-inches on center. Where retaining flanges are welded to duct wall, paint welds with zinc coating.

7. Single Wall Round Ductwork: Joint to incorporate beaded slip collar with minimum #8 sheet metal screws 8-inches on center. Seal ductwork as specified in this Section.

8. Seal joints and seams. Apply sealant to make end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

9. Double Wall Round Ductwork: Joint to incorporate beaded slip collar or flanged connection, with minimum #8 sheet metal screws 8-inches on center. Seal ductwork as specified in this Section.

10. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

11. Provide openings in ductwork where required to accommodate thermometers and control devices. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

12. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities as well as Code required clearances.

END OF SECTION

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SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Sheet Metal Materials
2. Dampers
3. Turning Vanes
4. Flexible Connectors

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Manufacturer's catalog data and fabrication/installation drawings for each factory fabricated duct accessory. Include leakage, pressure drop and maximum back pressure data.
2. Shop Drawings: Indicate air duct accessories.
3. Manufacturer's installation instructions: Provide instructions for each factory fabricated duct accessory.
4. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   a. See Division 01, General Requirements, Product Requirements for additional provisions.
   b. Extra Fusible Links: One of each type and size.

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1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section, with minimum five years of documented experience.

2. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

3. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.

4. AMCA 511 - Certified Ratings Program for Air Control Devices.

5. AMCA 611, latest edition - Certified Ratings Program - Product Rating Manual for Airflow Measurement Stations.

6. AMCA 610, latest edition - Laboratory Methods of Testing Airflow Measurement Stations for Performance Rating.

7. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

8. NFPA 92A - Smoke-Control Systems.

9. NFPA 92B - Smoke Control Systems in Atria, Covered Malls and Large Areas.

10. NFPA 101 - Life Safety Code.

11. UL 555 - Standard for Safety; Fire Dampers.

12. UL 555S - Standard for Safety; Leakage Rated Dampers for Use in Smoke Control Systems.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M. Galvanizing: 1-1/4 ounces per square foot total both sides; ducts to have mill-phosphatized finish for surfaces exposed to view.

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C. Stainless Steel: ASTM A 480/A 480M.

D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36-inches or less; 3/8-inch minimum diameter for lengths longer than 36-inches.

2.02 DAMPERS

A. Manufacturers:

1. Air Balance
2. Cesco
3. Greenheck
4. Nailor
5. Ruskin

B. Basis-of-Design:

1. Rectangular ductwork for velocities and pressures up to 1,500 fpm and 2.5-inch wg, respectively: Ruskin MD-35.
2. Rectangular ductwork for velocities and pressures up to 3,000 fpm and 4-inch wg, respectively: Ruskin CD-60.
3. Round ductwork for velocities and pressures up to 3,000 fpm and 4-inch wg, respectively: Ruskin CDSR-15.

C. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classes of 3-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

D. Rectangular Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design with linkage concealed in frame and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum 16 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.

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a. Roll-Formed Steel Blades: Galvanized sheet steel, 16 gauge thick for velocities up to 1,500 fpm, and 14 gauge thick for velocities up to 3,000 fpm.

b. Blade Axles: Minimum 1/2-inch diameter, plated steel, hex shaped, mechanically attached to blade.

c. Bearings: Molded synthetic sleeve, turning in extruded hole in frame.

d. Tie Bars and Brackets: Galvanized steel.

e. Mill galvanized.

E. Round Volume Dampers: Single-blade suitable for horizontal or vertical applications.

1. Steel Frames: Galvanized, roll formed, minimum of 20 gauge thick with beads at each end.

2. Blades: Minimum 14 gauge thick, galvanized sheet steel, round, single-piece.

3. Blade Axles: Minimum 1/2-inch square, plated steel, mechanically attached to blade.

4. Bearings: Molded synthetic sleeve, turning in hole in frame.

5. Finish: Mill galvanized.

6. Capacity:

a. Closed Position: Maximum pressure of 4-inches wg.

b. Open Position: Maximum air velocity of 3,000-feet per minute.

7. Leakage: Maximum 20 cfm at 4-inches wg.

8. Pressure Drop: Maximum 0.02-inch wg at 1,500-feet per minute through 20-inch diameter dampers.

F. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

2. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include 2-inch elevated platform for insulated duct mounting.

2.03 TURNING VANES

A. Manufacturers:

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1. Aerodyne
2. Ductmate Industries
3. Duro Dyno Corp.
4. Metalaire Inc.

B. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners to automatically align vanes.

C. Manufactured Turning Vanes: For medium pressure ductwork, ductwork upstream of terminal units, and in ductwork with equal inlet width and height dimensions and outlet width and height dimension, provide double thickness airfoil turning vanes. Low pressure ductwork and ductwork downstream of terminal units use either single thickness or double thickness turning vanes. For mitered rectangular elbows with changes in size from inlet to outlet, only use single thickness turning vanes. Use 2-inch radius vanes spaced on centers of 1.5-inches for single thickness. Use 2-inch radius vanes spaced on centers of 2.125-inches for double thickness.

D. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.04 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Duro Dyne Corp.
2. Ventfabrics Inc.
3. Ductmate Industries
4. Hardcast

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 4-inches wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Select metal compatible with ducts.

D. Provide a spring and bracket assembly to reinforce the fabric with sufficient tension to prevent connector collapse under negative or positive pressure. Number and positioning of spring-link fixture to be determined by the manufacturer to maintain straight axis and without kinks between two sections of duct, or between duct and the moving element. Hardcast Spring-Link SL-200, or equal.

E. Indoor System, Flexible Connector Fabric (FC-I): Glass fabric double coated with neoprene.

1. Minimum Weight: 30 ounces per square yard.

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2. Tensile Strength: 395 pounds of force per inch in the warp and 255 pounds of force per inch in the filling.

3. Service Temperature: -40 degrees F to 200 degrees F.

F. Outdoor System, Flexible Connector Fabric (FC-O): Glass fabric double coated with Hypalon, resistant to UV rays and ozone.

1. Minimum Weight: 26 ounces per square yard.

2. Tensile Strength: 225 pounds of force per inch in the warp and 300 pounds of force per inch in the filling.

3. Service Temperature: -40 degrees F to 200 degrees F.

G. High-Temperature System, Flexible Connectors (FC-HT): Glass fabric coated with silicone rubber.

1. Minimum Weight: 30 ounces per square yard.

2. Tensile Strength: 372 pounds of force per inch in the warp and 372pounds of force per inch in the filling.

3. Service Temperature: -70 degrees F to 500 degrees F.

H. High-Corrosive-Environment System, Flexible Connectors (FC-HC): Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 ounces per square yard.

2. Tensile Strength: 450 pounds of force per inch in the warp and 340 pounds of force per inch in the filling.

3. Service Temperature: -67 degrees F to 500 degrees F.

PART 3 - EXECUTION

3.01 DUCT ACCESSORIES GENERAL INSTALLATION

A. Inspect areas to receive air duct accessories. Notify Engineer of conditions that would adversely affect the installation of the dampers. Do not proceed until conditions are corrected.

B. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

C. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

D. Do not compress or stretch damper frames into duct or opening.

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E. Handle dampers using sleeve or frame. Do not lift dampers using blades, actuators, or jack shafts.

F. Adjust duct accessories for proper settings.

3.02 SHEET METAL MATERIALS INSTALLATION

A. Install bracing for multiple sections to support assembly weights and hold against system pressure. Install bracing as needed.

3.03 DAMPERS INSTALLATION

A. Where installing volume dampers in ducts with liner, avoid damage to and erosion of duct liner.

B. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts for air balancing. Install at a minimum of two duct widths from each branch takeoff. Provide balancing dampers for all air inlets and outlets.

C. Install dampers square and free from racking with blade running horizontally.

3.04 TURNING VANES INSTALLATION

A. Vanes must be installed, eliminating every other vane is not allowed.

B. Single thickness vanes cannot be over 36-inches long without intermediate vane runner.

C. Install per SMACNA and fasten/support to prevent vibration, noise, and to maintain proper alignment at design velocity.

3.05 FLEXIBLE CONNECTORS INSTALLATION

A. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators. Provide sheet metal weather cover over flexible connections located outdoors. Attach sheet metal to either equipment side or ductwork side, but not both.

B. Per NFPA, do not use flexible connectors on grease exhaust fans.

C. Securely attach spring-lock brackets to the metal strips of the connector collar using No. 8 sheet metal screws.

D. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

E. Adjust the following types in the following locations:

1. FC-I: Indoors.

2. FC-O: Outdoors.

3. FC-HT: High temperature exhaust systems and smoke removal systems.

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4. FC-HC: High corrosive systems inclusive of all laboratory exhaust systems.

END OF SECTION

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SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Grilles, Registers, Diffusers

1.02 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.

2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.

3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size and accessories furnished.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Air Distribution Diffuser, Register, and Grille Schedule lists Basis of Design, with any specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of Basis of Design:

a. Construction materials and appearance.

b. Frame/installation method.

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c. Isothermal throw plus or minus 5 percent at design flows shown on drawings.

d. Noise Criteria: NC value plus or minus 1 at design flows shown on drawings.

e. Accessories: Equal to Basis of Design.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23, HVAC sections, where more than a single type is specified for the application, provide single selection for each product category.

B. Grilles, Registers, Diffusers:

1. Anemostat
2. Carnes
3. Environmental Air Products
4. Krueger
5. Metalaire
6. Nailor
7. Price Co.
8. Shoemaker
9. Titus
10. Tuttle & Bailey
11. Seiho
12. Or approved equivalent.

2.02 GRILLES, REGISTERS, DIFFUSERS

A. Diffuser, Register and Grille Schedule lists Basis of Design, with specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of Basis of Design, including accessories and finish:

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1. Matching construction materials and appearance. Equal installation method/frame.

2. Pressure drop equal to or less than Basis of Design at CFM on Drawings.

3. Throw: Isothermal jet throw plus or minus 5 percent of Basis of Design at CFM listed on Drawings.

4. Noise Criteria: Plus or minus 1 NC of Basis of Design at CFM listed on Drawings. If Basis of Design NC is below registered level, submitted must match. NC rating with 10 dB room factor or less.

B. Provide 1-, 2-, 3-, or 4-way deflection as indicated on Drawings.

C. Provide pattern controllers for linear supply air diffusers.

D. Register Dampers: Dampers utilized with grilles. Opposed blade dampers utilizing a side operated worm drive which provides external duct operation. Slot the end of the shaft to receive a screwdriver. Factory assembled side operator. Construct of the same material as the grille. Manufacturer same as grilles/diffuser.

E. Coordinate mounting frames with ceiling construction type. Verify per reflected ceiling plans.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions. Provide seismic supports, clips, and bracing per local code. Coordinate installation of framing. Provide complete coverage of rough openings by integral device flanges or auxiliary frames. Where above ceiling location is unconditioned space, caulk rough openings; repair and re-paint locations where dust entrainment streaks develop due to unsealed openings.

B. Damp locations, such as lockers, restrooms, showers, natatoriums, whirlpool/spas, to have aluminum construction even if scheduled otherwise; mounting hardware to be stainless steel.

C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

D. Unless otherwise shown on drawings, for ceiling mounted air outlets with adjustable airflow pattern controllers mounted at a height of 12 feet or less, adjust the air outlets for horizontal air distribution, and adjust to vertical air distribution for ceiling height above 12 feet.

E. Exterior color of grilles per Architect. White finish if not otherwise scheduled or noted by Architect. Paint ductwork visible behind air outlets and inlets matte black.

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F. Ceiling Membrane: Protect ceiling membrane per code. Fire caulk around openings. Provide listed radiation damper in rated roof/ceiling or floor/ceiling assemblies as required per code.

G. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

3.02 GRILLES, REGISTERS, DIFFUSERS INSTALLATION

A. Coordinate with Architectural Reflected Ceiling Plan(s). Reflected ceiling plans determine final locations.

B. Install diffusers to ductwork with air tight connection. 18-inch straight duct section or acoustic plenum at connection. Provide square to round adapters where required for connection to round ducts.

C. Provide integral balancing dampers for diffusers, and grilles and registers where duct manual balancing dampers are not shown or specified.

D. Linear Slot Diffusers:

1. Coordinate connection plenum dimensions with linear slot final dimensions to conform with manufacturer's recommendations, or as indicated. Total and active lengths as noted on drawings. Blank off unused sections. Coordinate frame type with Architect.

2. Paint surfaces visible behind air outlets and inlets, including blank-off sections, matte black unless otherwise called for on drawings.

END OF SECTION

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SECTION 26 00 00
ELECTRICAL BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 DESIGN-BUILD SUMMARY

A. Work included in 26 00 00 applies to Division 26, Electrical work to provide materials, labor, tools, permits and incidentals to make electrical systems ready for Owner's use for proposed project.

1.02 DESIGN-BUILD INSTRUCTIONS

A. This document is issued to give Bidders a basis for preparing a proposal to design and install a complete electrical power, lighting and signal system for this project.

B. Alternates to this Document may be offered as a separate proposal.

C. Bidder to submit the following information with the Proposal:

1. Preliminary schematic drawing indicating power distribution system (one-line diagram) to include proposed system capacity and expansion capacity, expected available fault current at the service equipment, fault duty ratings of proposed equipment, load survey and maximum voltage drop at distribution equipment.

2. Description of lighting system, indicating luminaire types and manufacturer and method of control.

3. List of wiring materials proposed for systems which are applicable to this project, e.g., switchgear, panels, motor control centers, transformers, generators and transfer switches, life safety and signal system equipment, and the like.

4. Any other information which the bidder considers pertinent in evaluating the proposal.

1.03 DESIGN-BUILD APPROACH

A. Use this Specification for design/engineering requirements, workmanship and materials or construction. Utilize design-build concept throughout construction phase of project.

B. Investigate and be apprised of applicable codes, rules, and regulations as enforced by Authority Having Jurisdiction (AHJ).

C. Visit the Site of the proposed construction. Verify and inspect the existing site to determine conditions that affect this work.

1.04 DESIGN-BUILD CRITERIA/CALCULATIONS

A. Related Work Specified Elsewhere: Contents of Section apply to Division 26 specifications. Requirements of Section are a minimum for Division 26 Sections, unless otherwise stated in each Section, in which case that Section's requirements take precedence.

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B. Design Criteria: Reference Basis of Design narrative document.

C. Design Criteria:

1. Provide coordination with the serving electrical utility and make required provisions for multi-meter centers, meter sockets, CT cans, overcurrent protection.

2. Service Loads: Calculate service sizes. Utilize code acceptable diversity factors as allowed by code.

3. Electrical Metering:

   a. Provide multi-metering centers with fusible disconnects and metering sockets for each service. Provide metering centers with more than six disconnects projected with main fusible disconnects.

   b. Factory fabricate service entrance and metering equipment in accordance with governing codes.

   c. Provide 200 amp meters and raceway provisions minimum for each tenant space and provide feeders and main circuit breakers to tenants.

4. Electrical Distribution for Building Shell:

   a. Provide raceways to each potential tenant space for feeding tenant distribution panels. Install raceway overhead at bottom of structure along rear wall. Terminate each raceway at center of each tenant bay.

   b. Provide 120/208 volt, 3 phase, 4 wire house panels for facade and service area lighting, irrigation controls, service room lighting and receptacles.

   c. In tenant spaces over 200 amp provide feeders in 4-inch EMT.

5. Facade Lighting:

   a. Provide recessed metal halide downlights to provide 25 footcandles maintained with 4:1 uniformity ratio. Layout as detailed.

   b. Regressed diffusers, 100 watt metal halide lamps, similar to Capri MH51-T057.

6. Interior Lighting: Provide fluorescent strip lights in Electrical Rooms to maintain 25 footcandles. Controlled by switch at door.

7. Receptacles: Provide one receptacle in the Electrical Room. Provide additional weatherproof outlets as shown on Drawings (along canopy areas).

8. Signal Systems:

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a. Provide extension of telephone service lateral raceways and termination provision as required by serving telephone utility company.

b. Provide plywood telephone terminal cabinets with double duplex receptacles on single circuit in the Service Room.

c. Provide 1-inch distribution raceways from telephone terminals to each potential area. Run raceway overhead at bottom of structure at rear of building. Terminate each raceway at center of bay.

9. Fire Life Safety Systems: Provide system complete as necessary to meet requirements of code authorities.

10. Tenant Signage: Provide 3/4-inch raceway from junction box inside canopy in front of each potential tenant space. Include single 20 amp circuit to each tenant panel.

11. Design-Tenant Improvement:

a. General: In addition to requirements of the building shell design as described in Section above, provide complete design and installation of the tenant improvements as shown on Drawings and described in these Specifications.

12. Electrical Distribution for Tenant Improvement:

a. Base Tenant Distribution Size upon the Following:

1) Lighting: Number of 2- by 4 foot 3 lamp luminaires as shown on Drawings.

2) Receptacles: One per 20 feet linear distance along perimeter demising walls and/or as shown on Drawings.

3) HVAC: Per Division 23 design as approved by Owner.

4) Display Lighting: 10 watts per linear foot of storefront side only.

5) Signage: 1600 watts (one 120 volt, 20 amp circuit).

6) Future: Provide capacity in system for 30 percent more load than the sum of the five items above.

b. Minimum Tenant Distribution System Size: 200 amp at 120/208 volt, 3 phase, 4 wire.

c. Provide feeder conductors to tenant improvement areas as shown on Drawings.

d. Provide tenant distribution panelboard in tenant space, with main circuit breaker. Provide 42 pole circuit breakers as required by design plus 10 percent spare capacity.

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13. Lighting:

    a. Provide luminaires, branch circuiting and switching complete per Oregon State Energy Code.

    b. Luminaires: Lithonia 2GT with energy-saving ballasts and T8 octron lamps approved.

    c. Provide line voltage switching, dual level, located as directed by Architect.

    d. Provide 2 duplex receptacles in ceiling above storefront per tenant leasing layout. Provide branch circuiting complete, single circuit per receptacle.

14. Receptacles: Provide one 20 amp/1 phase duplex receptacle per 20 linear feet of perimeter walls and/or as shown on Drawings. Provide branch circuiting complete. Provide weatherproof receptacles and connections as shown on Drawings.

15. HVAC: Provide complete electrical connections to HVAC units as designed and installed by Contractor. Provide duplex receptacles on roof to have a duplex receptacle within 25 feet of each unit.

16. Toilet Room:

    a. Provide luminaire, Prescolite 9402 approved, branch circuiting, and line voltage switch at door.

    b. Provide electrical connection to fan as provided by Division 23 Contractor.

    c. Provide GFI receptacle, location as directed by Architect, including branch circuit wiring.

    d. Provide electrical connection to water heater or insta-hot.

17. Tenant Signage: Provide electrical connection junction box inside canopy for each tenant identified on Drawings. Provide single 120 volt circuit.

18. Electrical Service:

    a. Provide coordination with the serving electrical utility and make required provisions for multi-meter centers, meter sockets, CT cans, overcurrent protection.

    b. Service Loads: Calculate service sizes. Utilize Code acceptable diversity factors as allowed by Code.

    c. Provide two 400 amp spaces in Main Distribution Panel for future loads.

19. Electrical Metering:

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a. Provide a single meter for the building tenant main distribution panel.

b. Factory fabricate service entrance and metering equipment in accordance with governing codes.

20. Electrical Distribution for Building Shell:

a. Provide electrical distribution system at 277/480 volt to branch panelboards for lighting loads at each floor. Provide 277/480 volt branch panels for the mechanical VAV boxes with electric reheat. Provide connection for two rooftop AC units from the main distribution panelboard.

b. Provide two separate step down transformers 480 volt primary, 120/208 volt secondary. One transformer configuration will be standard type for the general purpose receptacle outlets and 120 volt loads. The other transformer configuration will be isolated type to feed the computer loads at the office work stations.

c. All low voltage wiring in the ceiling space will be plenum rated.

d. Provide 120/208 volt, 3 phase, 4 wire house panels for facade and service area lighting and receptacles, irrigation controls, service room lighting and receptacles.

21. Interior:

a. Lobby Areas and Corridors:

1) Provide 15 footcandles maintained in the lobby and corridors. See Architectural Reflected Ceiling Plans for luminaire location and luminaire types. Provide additional luminaires as needed to provide the minimum 15 footcandles. Coordinate with Architect for location and spacing.

2) Provide one 110 volt duplex convenience outlet 30 feet o.c. in the lobby, 50 feet o.c. in corridor areas.

3) Provide 4 foot, 2 lamp luminaires in the following areas to provide 20 footcandles:

(a) Janitor Rooms

(b) Elevator Equipment Room

(c) Electrical Rooms

(d) Fire Sprinkler Room

4) Provide emergency lighting of 1 footcandle average maintained throughout exit pathway.

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5) Provide one switch in each of the following rooms:

(a) Janitor Rooms

(b) Elevator Equipment Room

(c) Electrical Rooms

(d) Fire Sprinkler Room

b. Restrooms:

1) Provide fluorescent strip luminaires in recess over wash basin and water closet areas for cove lighting.

2) Provide one 110 volt GFCI duplex convenience outlet.

c. Stairwells:

1) Provide one wall-mounted, 4 foot, 2 lamp, fluorescent fixture at each landing.

2) Provide one each area of rescue assistance station at each stairwell above the first floor.

d. Open Office Areas: Provide on each of the floors fluorescent parabolic luminaires. Provide one luminaire for each 100sf of open office area. Luminaire: 3 lamp with 18 cell, 3-inch parabolic louver.

22. Site Work:

a. Provide six each site lighting bollards per site plan.

b. Provide seven each single headed 400 watt HPS vertical lamp fixture on 30 foot poles.

c. Provide four each single headed 400 watt HPS vertical lamp fixture on 20 foot poles.

d. Provide photoelectric switch and electronic time switch control for exterior lighting.

e. Provide eight each 4-inch PVC conduits from utility transformer to electrical service on first floor.

f. Provide pad/vault combination.

g. Provide two each 4 inch telephone conduits from 72nd Avenue to point of demarcation on the first floor.

h. Provide conduit for future fiber optic cable to the Electric Room.

23. Signal Systems:

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a. Provide extension of telephone service lateral raceways and termination provision as required by serving telephone utility company.

b. Provide plywood telephone terminal boards on each floor with double duplex receptacles on single circuit in the service room. Provide a ground strip with 6AWG ground conductor from the main distribution panel.

24. Fire Life Safety Systems: Provide system complete as necessary to meet requirements of code authorities.

25. Exterior Signage: Provide connection for two monument signs and wall-mounted signs as indicated on Architectural Drawings.

26. Exterior Building Lighting: Provide decorative exterior lights as selected by Architect. See Architectural Drawings.

D. Calculations:

1. Submit calculations for lighting energy consumption using the State of Oregon energy forms.

2. Submit service and feeder load data.

3. Submit fault duty calculations for entire electrical distribution system.

4. Submit voltage drop calculations from main service equipment to distribution and subdistribution centers.

5. Submit computer generated point-by-point calculation of parking lot lighting.

6. Submit lighting level calculations.

1.05 SECTION INCLUDES

A. Work included in 26 00 00, Electrical Basic Requirements applies to Division 26, Electrical work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of electrical systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:

1. Provide: To furnish and install, complete and ready for intended use.

2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.

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3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.

4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.

5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.06 RELATED SECTIONS

A. Contents of Section applies to Division 26, Electrical Contract Documents.

B. Related Work:

1. Additional conditions apply to this Division including, but not limited to:

a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.

b. Drawings

c. Addenda

d. Owner/Architect Agreement

e. Owner/Contractor Agreement

f. Codes, Standards, Public Ordinances and Permits

1.07 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, individual Division 26, Electrical Sections and those listed in this Section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:

1. State of Oregon:

a. OAR - Oregon Administrative Rules

b. 2023 OESC - Oregon Electrical Specialty Code

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c. 2022 OFC - Oregon Fire Code

d. 2022 OMSC - Oregon Mechanical Specialty Code

e. 2023 OPSC - Oregon Plumbing Specialty Code

f. 2022 OSSC - Oregon Structural Specialty Code

g. 2021 OEESC - Oregon Energy Efficiency Specialty Code

h. 2024 Oregon Elevator Specialty Code

C. Reference standards and guidelines include but are not limited to the latest adopted editions from:

1. ABA - Architectural Barriers Act
2. ADA - Americans with Disabilities Act
3. ANSI - American National Standards Institute
4. APWA - American Public Works Association
5. ASCE - American Society of Civil Engineers
6. ASHRAE Guideline 0, the Commissioning Process
7. ASTM - ASTM International
8. CFR - Code of Federal Regulations
9. EPA - Environmental Protection Agency
10. ETL - Electrical Testing Laboratories
11. FCC - Federal Communications Commission
12. FM - FM Global
13. IBC - International Building Code
14. IEC - International Electrotechnical Commission
15. IEEE - Institute of Electrical and Electronics Engineers
16. IES - Illuminating Engineering Society
17. ISO - International Organization for Standardization
18. MSS - Manufacturers Standardization Society
19. NEC - National Electric Code
20. NECA - National Electrical Contractors Association

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21. NEMA - National Electrical Manufacturers Association

22. NETA - National Electrical Testing Association

23. NFPA - National Fire Protection Association

24. OSHA - Occupational Safety and Health Administration

25. UL - Underwriters Laboratories Inc.

D. See Division 26, Electrical individual Sections for additional references.

1.08 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as individual Division 26, Electrical Sections.

B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C. In addition:

1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.

2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Provide a table of contents identifying the products being submitted for each specification section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. All transmissions/submissions to be submitted to Architect. Deviations will be returned without review.

   a. Provide separate submittals for lighting control cutsheets, and for lighting control shop drawings.

3. Product Data: Provide manufacturer's descriptive literature for products specified in Division 26, Electrical Sections.

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4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.

    a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.

    b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 26, Electrical specification Sections for specific items required in product data submittal outside of these requirements.

    c. See Division 26, Electrical individual Sections for additional submittal requirements outside of these requirements.

5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

6. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-16 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural documents.

7. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 26, Electrical Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals. Electric motors are supplied and installed by Division 23 unless otherwise specified. During shop drawing stage of the project, verify correct disconnect sizes, conductor sizes, etc., and bring any discrepancies to the attention of the Mechanical trade. Be responsible for any modifications to electrical equipment or installations as a result of equipment incompatibility discovered after shop drawing review.

8. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

9. Substitutions and Variation from Basis of Design:

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a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.

b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

10. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 26, Electrical specification Sections for additional requirements for shop drawings outside of these requirements.

    a. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.

11. Samples: Provide samples when requested by individual Sections.

12. Resubmission Requirements:

    a. Make corrections or changes in submittals as required in response to Engineer’s comments. Provide a cover letter with resubmittal that includes responses to each of the Engineer’s submittal review comments and identifies changes in the resubmittal. Cloud changes in the submittals.

        1) Resubmit for review until review indicates “no exception taken” or “make corrections noted.”

        2) When submitting drawings for Engineer's re-review, clearly indicate changes on drawings and cloud any revisions. Submit a list describing each change.

13. Operation and Maintenance Manuals, Owner's Instructions:

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a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.

1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.

2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment.

3) Include Warranty per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

4) Include product certificates of warranties and guarantees.

5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.

6) Include commissioning reports.

7) Include copy of startup and test reports specific to each piece of equipment.

8) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 26 00 00, Electrical Basic Requirements, Demonstration.

c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

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14. Record Drawings:

a. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of conduit, and location of concealed electrical items. Include items changed by field orders, supplemental instructions, and constructed conditions.

b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.

c. At completion of project, input changes to original project Revit Model and make one set of black-line drawings created from Revit model in version/release equal to contract drawings. Submit Revit model and drawings upon substantial completion.

d. Record drawings solely referencing field orders, supplemental instructions, etc. without any revision markups based on the change responses are not acceptable.

e. See Division 26, Electrical individual Sections for additional items to include in record drawings.

1.09 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e. distribution equipment, duct banks, light fixtures, etc.) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

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E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F. Making, supervising, or directing the making of an electrical installation which does not meet minimum safety standards is not allowed.

G. Except as authorized by the Authority Having Jurisdiction, do not remove, transfer, alter or otherwise tamper with an inspection permit, label, tag or other indicia of inspection placed on or at an electrical job site, electrical installation or electrical product.

1.10 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.11 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, plumbing equipment/fixtures, fire sprinklers, plumbing, lights, cable tray and electrical services with architectural and structural requirements, and other trades (including ceiling suspension and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

2.02 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL listed and labeled or be approved by State, County, and City authorities prior to procurement and installation.

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B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

C. Hazardous Materials:

1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.

2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.

3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Install equipment requiring access (i.e., junction boxes, light fixtures, power supplies, motors, etc.) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in passageways, doorways, scuttles or crawlspaces which would impede or block the intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Temporary Power:

1. Design of temporary power for construction is the responsibility of the Contractor. Remove temporary power prior to completion of Project.

E. Earthwork:

1. Confirm Earthwork requirements in Contract Documents. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

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a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork Sections. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.

b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.

c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

F. Firestopping:

1. Confirm requirements in Division 07, Thermal and Moisture Protection. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

G. Plenums:

1. In plenums, provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

H. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

I. Provide miscellaneous supports/metals required for installation of equipment and conduit.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 26 Electrical Sections.

B. Equipment Importance Factor: See Seismic Design Summary Table on Drawings for Importance Factors and Special Inspections Requirements.

C. General:

1. Earthquake resistant designs for Electrical (Division 26) equipment and distribution, i.e. power distribution equipment, generators, UPS, etc. to conform to regulations of jurisdiction having authority.

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2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.

3. Provide stamped shop drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for conduit and equipment. Submit shop drawings along with equipment submittals.

4. Provide stamped shop drawings from licensed Structural Engineer of seismic flexible joints for conduit crossing building expansion or seismic joints. Submit shop drawings along with seismic bracing details.

5. Provide means to prohibit excessive motion of electrical equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1. Underground conduit installation prior to backfilling.

2. Prior to covering walls.

3. Prior to ceiling cover/installation.

4. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Final Punch:

1. Prior to requesting a final punch visit from the Engineer, request from Engineer the Electrical Precloseout Checklist, complete the checklist confirming completion of systems' installation, and return to Engineer. Request a final punch visit from the Engineer, upon Engineer's acceptance that the electrical systems are ready for final punch.

2. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

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3.04 CUTTING AND PATCHING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements in Division 01, General Requirements, comply with individual Division 26, Electrical Sections and the following:

1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).

2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftspeople of each respective trade in conformance with appropriate Division of Work.

3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.

4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and/or walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.

5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.05 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.06 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage and handling to be replaced before installation.

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2. Protect equipment to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.

3. Protect bus duct and similar items until in service.

3.07 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, and individual Division 26, Electrical Sections.

B. Upon completion of work and adjustment of equipment, test systems and demonstrate to Owner's Authorized Representative, Architect, and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.08 CLEANING

A. Confirm Cleaning requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Upon completion of installation, thoroughly clean electrical equipment, removing dirt, debris, dust, temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.09 INSTALLATION

A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Install equipment and fixtures in accordance with manufacturers' installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

D. Provide miscellaneous supports/metals required for installation of equipment.

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3.10 PAINTING

A. Confirm requirements in Division 01, General Requirements and Division 09, Finishes. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces (i.e., hangers, hanger rods, equipment stands, etc.) with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.

2. In Electrical Room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.

3. See individual equipment Specifications for other painting.

4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.

5. Conduit: Clean, primer coat and paint interior/exterior conduit exposed in public areas with two coats paint suitable for metallic surfaces. Color selected by Architect.

6. Covers: Covers such as manholes, vaults and the like will be furnished with finishes which resist corrosion and rust.

3.11 DEMOLITION

A. Confirm requirements in Division 01, General Requirements and Division 02, Existing Conditions. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. It is the intent of these documents to provide necessary information and adjustments to electrical system required to meet code, and accommodate installation of new work.

2. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas. Owner will cooperate to best of their ability to assist in coordinated schedule, but will remain final authority as to time of work permitted.

3. Examination:

a. Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to locate and preserve utilities. Replace damaged items with new material to match existing.

b. Verify that abandoned wiring and equipment serve only abandoned facilities.

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c. Demolition drawings are based on casual field observation and existing record documents.

1) Verify accuracy of information shown prior to bidding and provide such labor and material as is necessary to accomplish work.

2) Verify location and number of electrical outlets, luminaires, panels, etc. in field.

d. Report discrepancies to Architect before disturbing existing installation.

1) Promptly notify Owner if utilities are found which are not shown on Drawings.

4. Execution:

a. Remove existing luminaires, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled for remodeling, relocation, or demolition unless shown as retained or relocated on Drawings.

b. Provide temporary wiring and connections to maintain electrical continuity of existing systems during construction. Remove or relocate electrical boxes, conduit, wiring, equipment, and luminaires, as encountered in removed or remodeled areas in existing construction affected by this work.

c. Remove and restore wiring which serves usable existing outlets clear of construction or demolition.

d. If existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, provide new conduit and wire to bypass inaccessible junction boxes and abandoned outlets.

e. If existing conduits pass through partitions or ceiling which are being removed or remodeled, provide new conduit and wire to reroute clear of construction or demolition and maintain service to existing load.

f. Extend circuiting and devices in existing walls to be furred out.

g. Remove abandoned wiring to source of supply.

h. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

i. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

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j. Disconnect and remove abandoned panelboards and distribution equipment.

k. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

l. Existing lighting which is to remain, leave luminaires in proper working order.

m. Repair adjacent construction and finishes damaged during demolition work.

n. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

3.12 ACCEPTANCE

A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In the absence of specific requirements, comply with individual Division 26, Electrical Sections and the following:

1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:

a. Cleaning

b. Operation and Maintenance Manuals

c. Training of Operating Personnel

d. Record Drawings

e. Warranty and Guaranty Certificates

f. Start-up/Test Document and Commissioning Reports

3.13 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 01, General Requirements, Section 26 00 00, Electrical Basic Requirements and individual Division 26, Electrical Sections.

B. Tests:

1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.

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2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

END OF SECTION

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SECTION 26 05 09
EQUIPMENT WIRING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Equipment connections, whether furnished by Owner or other Divisions of the Contract.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition:

1. Verify mechanical and utilization equipment electrical characteristics with Drawings and equipment submittals prior to ordering equipment. Submit confirmation of this verification as a part of, or addendum to, the electrical product submittals.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements apply to this Section.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and Equipment for Equipment Wiring: As specified in individual Sections.

2.02 GENERAL

A. Unless otherwise noted, the following voltage and phase characteristics apply to motors:

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1. 3/4 HP and Under: 120 volt, 1 phase.

2. 1 HP and Less than 5 HP Loads: 208 volt, 3 phase.

3. 5 HP and Over: 208 volt, 3 phase.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to submittal of product data for electrical distribution equipment, obtain and examine product data and shop drawings for equipment furnished by the Owner and by other trades on the project. Update the schedule of equipment electrical connections accordingly, noting proper ratings for overcurrent devices, fuses, safety disconnect switches, conduit and wiring, and the like. As a minimum, this requirement applies to equipment furnished by Owner and equipment furnished under the following divisions of work under this contract:

1. Division 08, Openings

2. Division 11, Equipment

3. Division 21, Fire Suppression

4. Division 22, Plumbing

5. Division 23, HVAC, Heating, Ventilating and Air Conditioning

3.02 INSTALLATION

A. Do not install unrelated electrical equipment or wiring on mechanical equipment without prior approval of Architect.

B. Provide moisture tight equipment wiring and switches in ducts or plenums used for environmental air.

C. Connect motor and appliance/utilization equipment complete from panel to motor/equipment as required by code.

D. Install motor starters and controllers for equipment furnished by others.

E. Appliance/Utilization Equipment:

1. Provide appropriate cable and cord cap for final connection unless equipment is provided with same. Provide receptacle configured to receive cord cap.

2. Verify special purpose outlet NEMA configuration and ampere rating with equipment supplier prior to ordering wiring devices and coverplates.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Division 01, General Requirements.

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3.04 SYSTEMS STARTUP

A. Provide field representative to prepare and start equipment.

1. Test and correct for proper rotation of polyphase motors.

B. Adjust for proper operation within manufacturer's published tolerances.

C. Demonstrate proper operation of equipment to Owner's Authorized Representative.

END OF SECTION

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SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Lugs and Pads
2. Wires and Cables
3. Connectors

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Cable insulation test reports in project closeout documentation.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Lugs and Pads:

1. Anderson
2. Ilsco

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3. Panduit
4. Thomas & Betts
5. 3M
6. Or approved equivalent.

B. Wires and Cables:

1. General:
   a. General Cable
   b. Okonite
   c. Southwire
   d. Encore Wire
   e. Or approved equivalent.
2. Metal Clad Cable - Type MC:
   a. Alflex
   b. AFC
   c. General Cable
   d. Southwire
   e. Encore Wire
   f. Or approved equivalent.

C. Connectors:

1. Anderson Power Products
2. Burndy
3. Ilsco
4. 3M
5. Thomas & Betts
6. Or approved equivalent.

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2.02 LUGS AND PADS

A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

B. Copper Pads: Drilled and tapped for multiple conductor terminals.

C. Lugs: Compression type for use with stranded branch circuit or control conductors; mechanical type for use with solid branch and feeder circuit conductors.

2.03 WIRES AND CABLES

A. Building Wires:

1. Copper: Soft-drawn with conductivity of not less than 98 percent IACS at 20 degrees C (68 degrees F). 600 volt rated throughout. Conductors 12 AWG and 10 AWG, solid or stranded. Conductors 8 AWG and larger, stranded. 12 AWG minimum conductor size. Minimum insulation rating of 90 degrees C. Insulation Type: THHN/THWN-2.

B. Phase color to be consistent at feeder terminations; A-B-C, top to bottom, left to right, front to back.

C. Color Code Conductors as Follows:

PHASE	**208 VOLT WYE**	**240 VOLT DELTA**	**480 VOLT**
A	Black	Black	Brown
B	Red	Orange (High Leg)	Orange
C	Blue	Blue	Yellow
Neutral	White	White	Gray or White w/colored strip
Ground	Green	Green	Green
Isolated Ground	Green w/yellow trace	N/A	N/A

D. MC Cable:

1. Standard: High strength galvanized steel flexible armor. Full length minimum size No. 12 copper ground wire, copper dual rated THHN/THWN-2, full length tape marker phase/circuit identification on cable armor. Short circuit throat insulators, mechanical compression termination.

E. AC Cable (Armored Cable): Not allowed.

F. NMB Cable: Not allowed.

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2.04 CONNECTORS

A. Split bolt connectors not allowed.

B. Conductor Branch Circuits: Wire nuts with integral spring connectors for conductors 12 AWG through 8 AWG. Push-in type connectors where conductors are not required to be twisted together are not acceptable.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer instructions and OESC.

B. Field Quality Control:

1. Test conductor insulation on feeders of 100 amp and greater for conformity with 1000 volt megohmmeter. Use Insulated Cable Engineers Association testing procedures. Minimum insulation resistance acceptable is 1 megohm for systems 600 volts and below. Notify Architect if insulation resistance is less than 1 megohm.

2. Test Report: Prepare a typed tabular report indicating the testing instrument, the feeder tested, amperage rating of the feeder, insulation type, voltage, the approximate length of the feeder, conduit type, and the measured resistance of the megohmmeter test. Submit test reports with project closeout documents.

3. Inspect and test in accordance with NETA Standard ATS, except Section 4.

4. Perform inspections and tests listed in NETA Standard ATS, Section 7.3.2.

3.02 LUGS AND PADS

A. Thoroughly clean surfaces to remove all dirt, oil, grease, or paint.

B. Use torque wrench to tighten per manufacturer's directions.

3.03 WIRES AND CABLES

A. General:

1. Do not install or handle thermoplastic insulated wire and cable in temperatures below -10 degrees C (14 degrees F). Do not handle thermoset insulated wire and cable in temperatures below -40 degrees C (-40 degrees F). All wire and cable must be acclimated to temperatures above freezing for no less than 24 hours prior to installation.

2. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.

3. Install conductors with care to avoid damage to insulation.

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4. Do not apply greater tension on conductors than recommended by manufacturer during installation.

5. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation. Do not use pulling compounds for installation of conductors connected to GFCI circuit breakers or GFCI receptacles.

6. Conductor Size and Quantity:

   a. Install no conductors smaller than 12 AWG unless otherwise shown.

   b. Provide required conductors for a fully operable system.

   c. Power Circuits: No. 12 AWG minimum, except as follows:

      1) No. 10 AWG for 20A, 120V circuits longer than 60-feet but not exceeding 89-feet.

      2) No. 8 AWG for 20A, 120V circuits longer than 90-feet but not exceeding 139-feet.

      3) Notify Engineer of 20A, 120V circuits exceeding 140-feet if not shown on Drawings.

   d. When exact run lengths are determined for all branch circuits, and prior to installation of the conductors, ensure that the maximum voltage drop, based on 80 percent of the circuit protective device, does not exceed 3 percent. Increase wire size from No. 12 AWG, if necessary, to ensure that the 3 percent voltage drop is not exceeded.

7. Provide dedicated neutrals (one neutral conductor for each phase conductor) in all 120V circuits.

B. Conductors in Cabinets:

1. Conductors and cables within panels and cabinets are to be made up in a clean and workmanlike manner.

2. Cable and tree wires in panels and cabinets for power and control. Use plastic ties in panels and cabinets.

3. Tie and bundle feeder conductors in wireways of panelboards.

4. Hold conductors away from sharp metal edges.

C. Homeruns:

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1. Do not change intent of branch circuit homeruns without approval. Homeruns for 20A branch circuits may be combined to a maximum of six current carrying conductors including neutral conductors in homeruns. Apply derating factors as required per NEC. Increase conductor size as needed.

2. MC cable homeruns are not allowed.

D. Identify wire and cable under the provisions of Section 26 05 53, Identification for Electrical Systems. Identify each conductor with its panel and circuit number as indicated.

E. Exposed cable is not allowed.

F. All cable must be run parallel or perpendicular to building lines and hidden from view when possible. Where installed in tray each power cable is to be identified with Lamacoid nametag engraved with identification of equipment being fed. Tag to be fastened to cable using tie-wraps. Provide nametag at each floor level.

G. Do not install PVC jacketed cables in return air plenums, unless they are specially rated plenum cables.

H. Use of MC Cable is limited to the following conditions. Installations that do not comply with the following conditions are to be removed and replaced with no additional expense to the Owner.

1. 15 and 20 amp branch wiring where following conditions apply:

a. Use MC cable for final flexible connections from junction or outlet boxes to recessed fixtures. Do not use MC cables to loop between fixtures, except where it is not practical to provide conduit connections between boxes or where existing inaccessible ceilings prevent installation of conduit runs. Each individual luminaire is to be serviced by an individual cable drop from the associated junction box in the ceiling space. Maximum length 6-feet of MC cable. Luminaire drops secured to, and supported by, the building structure with nylon tie wraps. The use of the ceiling suspension system for support of any type of cabling is not permitted.

b. MC cable may be routed in the void space above hard lid ceilings, and routed within wall cavities, including below glazing, provided OESC requirements are otherwise met, and a minimum one 0.75-inch conduit is routed from nearest accessible ceiling space to inaccessible location, terminating in a j-box with blank faceplate, for future circuits.

c. Do not use in walls in areas where MC cable cannot be fished into the walls after construction is completed. For example, walls with glazing or solid beams overhead, partial height walls, etc.

3.04 CONNECTORS

A. Install to assure a solid and safe connection.

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B. Select hand twist connectors for wire size and install tightly on conductors.

C. Install compression connectors using methods and tools recommended by the manufacturer.

D. Do not install stranded conductors under screw terminals unless compression lugs are installed.

E. Do not connect wiring without UL listed connectors that are listed for the purposes.

END OF SECTION

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Connectors and Accessories

2. Grounding Conductor

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Test reports of ground resistance for service and separately derived system grounds.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Comply with the requirements of ANSI/NFPA 70.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Connectors and Accessories:

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1. Burndy Hyground Compression System
2. Erico/Cadweld
3. Amp Ampact Grounding System
4. Pipe Grounding Clamp:
    a. Burndy GAR Series
    b. O Z Gedney
    c. Thomas & Betts
    d. Or approved equivalent.

B. Grounding Conductor

1. General Cable
2. Okonite
3. Southwire
4. Or approved equivalent

2.02 CONNECTORS AND ACCESSORIES

A. Grounding Connectors: Hydraulic compression tool applied connectors or exothermic welding process connectors or powder actuated compression tool applied connectors.

B. Pipe Grounding Clamp: Mechanical ground connector with cable parallel or perpendicular to pipe.

2.03 GROUNDING CONDUCTOR

A. Grounding Electrode Conductor: Soft-draw bare stranded copper for wire sizes larger than #10 AWG Bare. Solid copper for wire sizes #10 AWG and smaller.

B. Equipment Grounding Conductor: Green insulated, insulation type to match that of associated feeder or branch circuit wiring, size as indicated on Drawings.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Verify site conditions prior to beginning work.

B. Bond sections of service equipment enclosure to service ground bus.

C. Separately Derived Systems: Ground each separately derived system per NEC Article 250.

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D. Corrosion inhibitors: Apply a corrosion inhibitor to contact surfaces when making grounding and bonding connections. Use corrosion inhibitor appropriate for protecting a connection between metals used.

E. Grounding system resistance to ground not to exceed 5 ohms. Make necessary modifications or additions to grounding electrode system for compliance. Submit final tests to assure that this requirement is met.

F. Resistance of grounding electrode system: measure using a four-terminal fall-of-potential method as defined in IEEE 81. Take ground resistance measurements before electrical distribution system is energized and in normally dry conditions, not less than 48 hours after last rainfall. Take resistance measurements of separate grounding electrode systems before systems are bonded together below grade. Combined resistance of separate systems may be used to meet required resistance, but specified number of electrodes must still be provided.

G. Inspect and test in accordance with NETA Standard ATS, except Section 4.

H. Perform inspections and tests listed in NETA Standard AB, Section 7.13.

3.02 CONNECTORS AND ACCESSORIES INSTALLATION

A. Install per manufacturer's instructions.

3.03 GROUNDING CONDUCTOR INSTALLATION

A. Raceways:

1. Ground metallic raceway systems. Bond to ground terminal with code size jumper except where code size or larger equipment grounding conductor is included with circuit, use grounding bushing with lay-in lug.

2. Connect metal raceways, which terminate within an enclosure but without mechanical connection to enclosure, by grounding bushings and ground conductor to grounding bus.

3. Where equipment supply conductors are in flexible metallic conduit, install stranded copper equipment grounding conductor from outlet box to equipment frame.

4. Install equipment grounding conductor, code size minimum unless noted on drawings, in metallic and nonmetallic raceway systems.

B. Feeders and Branch Circuits:

1. Provide continuous green insulated copper equipment grounding conductors for feeders and branch circuits.

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2. Where installed in a continuous solid metallic raceway system and larger sizes are not detailed, provide insulated equipment grounding conductors for feeders and branch circuits sized in accordance with the latest adopted edition of NEC Article 250, Table 250-122.

C. Ladder Rack and Network Cabinets:

1. Provide continuous green insulated copper equipment ground, minimum #6 AWG, from OFCI ladder rack and network cabinets to telecom grounding busbar. Grounding conductor routed horizontally in ladder rack and vertically in conduit. Provide bushings at cut ends to protect cable insulation.

D. Bond boxes, cabinets, enclosures and panelboard equipment grounding conductors to enclosure with specified conductors and lugs. Install lugs only on thoroughly cleaned contact surfaces.

E. Motors, Equipment, and Appliances: Install code size equipment grounding conductor to (motor) equipment frame or manufacturer's designated ground terminal.

F. Receptacles: Connect ground terminal of receptacle and associated outlet box to equipment grounding conductor. Self grounding nature of receptacle devices does not eliminate equipment grounding conductor bolted to outlet box.

END OF SECTION

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SECTION 26 05 33
RACEWAYS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Metal Conduit
2. Electrical Metallic Tubing (EMT)
3. Flexible Metal Conduit (FMC)
4. Liquidtight Flexible Metal Conduit (LFMC)
5. Electrical Polyvinyl Chloride (PVC) Conduit
6. Conduit Fittings

B. Provide a complete system of conduit and fittings, with associated couplings, connectors, and fittings, as shown on Drawings and described in these Specifications.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Section 26 05 34, Boxes

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

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1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.07 DEFINITIONS

A. Raceway system is defined as consisting of conduit, tubing, duct, and fittings including but not limited to connectors, couplings, offsets, elbows, bushings, expansion/deflection fittings, and other components and accessories. Complete electrical raceway installation before starting the installation of conductors and cables.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit:

1. Allied Tube & Conduit
2. Thomas & Betts Corporation
3. Robroy Industries
4. O'kote Inc.
5. Or approved equivalent.

B. Electrical Metallic Tubing (EMT):

1. Allied Tube & Conduit
2. Beck Manufacturing WL
3. Picoma
4. Wheatland Tube Company
5. Or approved equivalent.

C. Flexible Metal Conduit (FMC):

1. AFC Cable Systems Inc.
2. Electri-Flex Company
3. International Metal Hose
4. Or approved equivalent.

D. Liquidtight Flexible Metal Conduit (LFMC):

1. AFC Cable Systems Inc.

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2. Electri-Flex Company

3. International Metal Hose

4. Or approved equivalent.

E. Electrical Polyvinyl Chloride (PVC) Conduit:

1. AFC Cable Systems Inc.

2. Electri-Flex Company

3. International Metal Hose

4. JM Eagle

5. Or approved equivalent.

F. Conduit Fittings:

1. Bushings:

a. Insulated Type for Threaded Raceway Without Factory Installed Plastic Throat Conductor Protection:

1) Thomas & Betts 1222 Series

2) O-Z Gedney B Series

3) Or approved Equivalent.

2. Raceway Connectors and Couplings:

a. Thomas & Betts Series

b. O-Z Gedney Series

c. Or approved Equivalent.

3. Expansion/Deflection Fittings:

a. EMT: O-Z Gedney Type TX

b. RMC: O-Z Gedney Type AX, DX and AXDX, Crouse & Hinds XD

c. PVC: O-Z Gedney Type DX with PVC adapters, Carlon E945 Series, Kraloy OPEJ Series

d. Or approved equivalent.

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2.02 POLYVINYL CHLORIDE (PVC) EXTERNALLY COATED GALVANIZED RIGID METAL CONDUIT

A. Description: UL 6, ANSI C80.1, and NEMA RN 1; rigid steel conduit with external PVC coating.

1. PVC Coating: Minimum 40 mils in thickness.

B. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. Description: UL 797, ANSI C80.3; steel galvanized tubing.

B. Fittings: NEMA FB 1; steel, compression type.

2.04 FLEXIBLE METAL CONDUIT (FMC)

A. Description: UL 1, interlocked steel construction.

B. Fittings: NEMA FB 2.20.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: UL 360, inner core made from spiral wound strip of heavy gauge, hot dipped galvanized low carbon steel. 3/4-inch through 1-1/4-inch trade sizes to have a square lock core and contain an integral bonding strip of copper. 1-1/2-inch and larger to have fully interlocked core. Jacket material to be moisture, oil, and sunlight resistant flexible PVC.

B. Fittings: NEMA FB 2.20.

2.06 ELECTRICAL POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: UL 651, NEMA TC 2; Schedule 40 PVC.

B. Fittings: NEMA TC 3.

C. Plastic Utilities Duct: NEMA TC 6/8; PVC Type DB.

D. Plastic Utility Duct Fittings: NEMA TC 9.

2.07 CONDUIT FITTINGS

A. Bushings:

1. Insulated type for threaded raceway connectors without factory-installed plastic throat conductor protection.

2. Insulated grounding type for threaded raceway connectors.

B. Raceway Connectors and Couplings:

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1. Steel connectors, couplings, and conduit bodies, hot-dip galvanized.

2. Connector locknuts to be steel, with threads meeting ASTM tolerances. Locknuts to be hot-dip galvanized.

3. Connector throats (EMT, flexible conduit, metal clad cable and cordset connectors) to have factory installed plastic inserts permanently installed. For normal cable or conductor exiting angles from raceway, the cable jacket or conductor insulation to bear only on plastic throat insert.

4. Steel gland, Tomic or Breagle connectors and couplings are recognized for this Contract as having acceptable raceway to fitting electrical conductance.

5. Set screw connectors and couplings, without integral compression glands, are recognized for this Contract as not having acceptable raceway to fitting electrical conductance. A ground conductor sized per this Specification must be included and bonded within raceway assembly utilizing this type connector or coupling.

C. Provide expansion/deflection fittings for EMT.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Finished Surfaces: Schedule raceway installation to avoid conflict with installed wall and ceiling surfaces. If unavoidable, coordinate work and repairs with Architect.

B. Conduit Size:

1. Minimum Size: 3/4-inch for power and control, unless otherwise noted. 3/4-inch for communication/data, unless otherwise noted. 3/4-inch for signal systems, unless otherwise noted.

C. Provide two pull strings/tapes in empty conduits. Types:

1. High-strength, stretch resistant, woven polyester. Factory lubricated to reduce burn-through.

2. Feeders: 5/8-inch, 1,800-pound rated, Greenlee 4436, Mule Tape, Herculine, or approved equivalent.

3. Branch Circuits and Low Voltage: 1/2-inch, 1,250-pound rated, Greenlee 4435, Mule Tape, Herculine, or approved equivalent.

4. If fish tape is used for pulling line or low voltage wiring, fiberglass type to be used. Metal fish tapes not allowed.

5. Secure pull string/tape with minimum 6-feet extended at each end.

6. Install pull string/tape after conduit is joined and glue is dry.

7. Provide caps on ends of empty conduit to be used in future.

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8. Label both ends of empty conduits with location of opposite end.

D. Elbows: Use PVC coated RMC for underground installations.

1. Elbows in utility conduits must be factory made. Field bends or heat bends are not allowed.

E. Elbow for Low Energy Signal Systems: Use long radius factory ells where linking sections of raceway for installation of signal cable.

F. When installing utility conduit, 6-inch or smaller, sweeps must be separated by a straight section of at least 5-feet in length and an initial horizontal straight section of at least 3-feet beginning from the vault.

G. Verify that field measurements are as shown on Drawings.

H. Plan locations of conduit runs in advance of the installation and coordinate with ductwork, plumbing, ceiling and wall construction in the same areas.

I. Locate penetrations and holes in advance where they are proposed in the structural sections such as footings, beams, and walls. Penetrations are acceptable only when the following occurs:

1. Where shown on the Structural Drawings.

2. As approved by the Structural Engineer prior to construction, and after submittal of drawing showing location, size, and position of each penetration.

J. Verify routing and termination locations of conduit prior to rough-in.

K. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

L. Install raceways securely, in neat and workmanlike manner, as specified in NECA 1, Standard Practices for Good Workmanship in Electrical Construction.

M. Duct proof all underground conduits to remove dirt and debris and ensure conduit is not obstructed, out-of-round, or collapsed. Utilize a wood test mandrel (or equivalent plastic/hard-rubber) configured for the conduit inside diameter.

N. Install steel conduit as specified in NECA 101, Standard for Installing Steel Conduits.

O. Install nonmetallic conduit in accordance with manufacturer's instructions.

P. Inserts, anchors and sleeves.

1. Coordinate location of inserts and anchor bolts for electrical systems prior to concrete pour.

2. Coordinate location of sleeves with consideration for other building systems prior to concrete pour.

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Q. Conduit Supports:

1. Arrange supports to prevent misalignment during wiring installation.

2. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

3. Group related conduits; support using conduit rack. Construct rack using steel channel. Provide space on each for conduits.

4. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

5. Do not attach conduit to ceiling support wires.

R. Flexible metal conduit length not-to-exceed 6-feet, 3-feet in concealed walls. Provide sufficient slack to reduce the effect of vibration.

S. Install conduit seals at boundaries where ambient temperatures differ by 10 degrees F or more as shown on the drawings. Install seals on warm side of partition.

T. Seal raceways stubbing up into electrical equipment. Plug raceways with conductors with duct-seal. Cap spare raceways and plug PVC raceway products with plastic plugs as made by Underground Products, or equal, shaped to fit snugly into the stubup.

U. Seal raceways penetrating an exterior building wall to prevent moisture and vermin from entering into the electrical equipment.

V. Use suitable caps on spare and empty conduits to protect installed conduit against entrance of dirt and moisture.

W. Keep 277/480 volt wiring independent of 120/208 volt wiring. Keep power wiring independent of communication system wiring.

X. Keep emergency system wiring independent of other wiring systems per NEC 700.

Y. Arrange conduit to maintain headroom and present neat appearance.

Z. Do not install conduits on surface of building exterior, along vapor barrier, across roof, on top of parapet walls, or across floors, unless otherwise noted on drawings.

AA. Exposed conduits are permitted only in following areas:

1. Mechanical rooms, electrical rooms or spaces where walls, ceilings and floors will not be covered with finished material.

2. Existing walls that are concrete or block construction.

3. Where specifically noted on Drawings.

4. Route exposed conduit parallel and perpendicular to walls, tight to finished surfaces and neatly offset into boxes.

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BB. Do not install conduits or other electrical equipment in obvious passages, doorways, scuttles or crawl spaces which would impede or block area passage's intended usage.

CC. Install continuous conduit and raceways for electrical power wiring.

DD. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

EE. Maintain adequate clearance between conduit and piping.

FF. Keep conduits a minimum of 12-inches away from steam or hot water radiant heating lines (at or above 104 degrees F) or 3-inches away from waste or water lines.

GG. Cut conduit square using saw or pipecutter; deburr cut ends.

HH. Bring conduit to shoulder of fittings; fasten securely.

II. Use conduit hubs to fasten conduit to cast boxes in damp and wet locations.

JJ. Install no more than the equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.

KK. Use factory elbows bends in metal conduit larger than 2-inch size.

LL. Avoid moisture traps.

MM. Conduit Terminations for Signal Systems: Provide a plastic bushing on the end of conduit used for signal system wiring.

NN. Feeders: Do not combine or change feeder runs.

OO. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07, Thermal and Moisture Protection.

PP. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation and installer.

3.02 POLYVINYL CHLORIDE (PVC) EXTERNALLY COATED GALVANIZED RIGID METAL CONDUIT INSTALLATION

A. Use PVC coated RMC 36-inch radius ells for power service conduits and 48-inch radius ells for telephone service conduits.

3.03 ELECTRICAL METALLIC TUBING (EMT) INSTALLATION

A. Dry Locations:

1. Concealed: EMT.

2. Exposed: EMT.

B. Dry, Protected: EMT.

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3.04 FLEXIBLE METAL CONDUIT (FMC) INSTALLATION

A. Dry Locations: Motors, recessed luminaires and equipment connections subject to movement or vibration, use flexible metallic conduit.

B. Install 12-inch minimum slack loop on flexible metallic conduit.

3.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC) INSTALLATION

A. Use PVC coated liquidtight flexible metallic conduit for motors and equipment connections subject to movement or vibration and subjected to any of following conditions: Exterior location, moist or humid atmosphere, corrosive environments, water spray, oil, or grease.

B. Install 12-inch minimum slack loop on liquidtight flexible metallic conduit.

3.06 ELECTRICAL POLYVINYL CHLORIDE (PVC) CONDUIT INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide equipment grounding conductor in PVC conduit runs containing power conductors.

C. Underground Installation:

1. Areas subject to vehicular traffic: Schedule 80 PVC.

2. Other underground applications: Schedule 40 PVC, except where prohibited by the NEC or local codes.

D. Convert PVC conduit to Rigid Metal Conduit (RMC) prior to emerging from underground, concrete encasement, or concrete slab.

E. Provide expansion fittings to compensate for expansion and contraction per NEC 352.44.

F. PVC elbows are not acceptable. Use PVC coated RMC.

G. Trim cut ends inside and outside to remove rough edges.

H. Provide bushings when entering a box, fitting or other enclosure.

I. Provide all excavation and backfill required to support Division 01 and this Division of work. Coordinate trench specs for concrete, soil or sand backfill.

J. Excavate trenches 6-inches deeper and wider than ductbank burial and cross-sectional requirements. Remove from the site all excavated materials not suitable or specified for backfill.

K. Backfill trenches with sand, tamped firm and even to trench depth level.

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L. Backfill with non-expansive soil with limited porosity. Deposit all backfill soil in 6-inch layers. Thoroughly and carefully tamp all backfill soils to 90-95 percent compaction until the ductbank is covered by no less than 12-inches of material. Backfill and tamp the remainder of the excavation at 12-inch intervals. Uniformly grade the finished surface.

M. Provide sheeting, shoring, dewatering and cleaning required to keep the trenches and their grades in proper condition for the work to be carried on.

N. Restore all landscape and paving to like-new to match existing.

O. Slope raceways away from buildings and drain towards manholes or vaults with a minimum slope of 3 percent. Drain raceways into manholes or vaults, not into building structures or panels. Where sloping cannot be fully provided and there is a section of raceway where water would flow to a panel, switchboard, transformer, or building, provide a means to discharge the excess water from the raceway or raceway system, consisting of a box or fitting at a low point prior to equipment entry or at building entry, with a fitting or plug that can be removed to allow drainage.

P. Cut raceway square using saw or pipe cutter; de-burr cut ends.

Q. Insert raceway to shoulder of fittings; fasten securely.

R. Join raceway using adhesive as recommended by manufacturer.

S. Wipe raceway dry and clean before joining. Apply full even coat of adhesive to entire area inserted into fitting. Allow joint to cure for 20 minutes, minimum.

T. Number of equivalent 90 degree bends permitted between pull points: Maximum of three bends for power system conduit banks.

U. Provide suitable fittings to accommodate expansion and deflection where required.

V. Terminate raceway at manhole entries using end bells.

W. Use suitable separators and chairs installed not greater than 5-feet on centers.

X. Provide 1/4-inch polypropylene pull rope in each empty raceway except sleeves and nipples.

Y. Swab raceway. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Z. Interface installation of underground warning tape with backfilling. Install tape 6-inches below finished surface.

3.07 CONDUIT FITTINGS INSTALLATION

A. Conduit Joints: Assemble conduits continuous and secure to boxes, panels, luminaires and equipment with fittings to maintain continuity. Provide watertight joints where embedded in concrete, below grade or in damp locations. Seal metal conduit with metal thread primer. Rigid conduit connections to be threaded, clean and tight (metal to metal). Threadless connections are not permitted for RMC.

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B. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

C. Use set screw type fittings only in dry locations. When set screw fittings are utilized provide insulated continuous equipment ground conductor in conduit, from overcurrent protection device to outlet.

D. Use compression fittings in dry locations, damp and rain-exposed locations. Maximum size permitted in damp locations and locations exposed to rain is 2-inches in diameter.

E. Use threaded type fittings in wet locations, and damp or rain-exposed locations where conduit size is greater than 2-inches.

F. Use PVC coated, threaded type fittings in corrosive environments.

G. Use insulated type bushings with ground provision at switchboards, panelboards, safety disconnect switches, junction boxes that have feeders 60 amperes and greater.

H. Condulets and Conduit Bodies:

1. Do not use condulets and conduit bodies in conduits in feeders 100 amp and larger.

I. Sleeves and Chases - Floor, Ceiling and Wall Penetrations: Provide necessary conduit sleeves, openings and chases where conduits or cables are required to pass through floors, ceilings, or walls.

J. Expansion Joints:

1. Provide conduits crossing expansion joints where cast in concrete with expansion-deflection fittings, installed per manufacturer's recommendations.

2. Secure conduits 3-inches and larger to building structure on opposite sides of a building expansion joint with an expansion-deflection fitting across joint installed per manufacturer's recommendations.

3. Provide conduits less than 3-inches where not cast in concrete with junction boxes securely fastened on both sides of expansion joint, connected together with 15-inches of slack (minimum of 15-inches longer than straight line length) flexible conduit and copper green ground bonding jumper. In lieu of this flexible conduit, an expansion-deflection fitting, as indicated for conduits 3-inch and larger may be installed.

4. Verify expansion/deflection requirements with Structural Engineer prior to installation.

K. Seismic Joints:

1. No conduits cast in concrete allowed to cross seismic joint.

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2. Provide conduits with junction boxes securely fastened on both sides of seismic joint, connected together with 15-inches of slack (minimum of 15-inches longer than straight line length) flexible conduit and copper green ground bonding jumper. Prior to installation, verify with Architect that 15-inches is adequate for designed movement, and if not, increase this length as required.

3. Provide conduits less than 3-inches where not cast in concrete with junction boxes securely fastened on both sides of expansion joint, connected together with 15-inches of slack (minimum of 15-inches longer than straight line length) flexible conduit and copper green ground bonding jumper. In lieu of this flexible conduit, an expansion-deflection fitting, as indicated for conduits 3-inches and larger may be installed.

L. Provide rigid conduit coupling flush with surface of slab or wall for conduit stubbed in concrete slab or wall to serve electrical equipment or an outlet under table or to supply shop tool, etc. Provide plug where conduit is to be used in future.

END OF SECTION

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SECTION 26 05 34
BOXES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Outlet Boxes
2. Pull and Junction Boxes
3. Box Extension Adapter

B. Provide electrical boxes and fittings for a complete installation. Include but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts and other necessary components.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1. Section 26 05 33, Raceways
2. Section 26 05 53, Identification for Electrical Systems

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

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PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Outlet Boxes:

1. Hubbell
2. Thomas & Betts
3. Eaton/Crouse-Hinds
4. Or approved equivalent.

B. Pull and Junction Boxes:

1. Eaton/Crouse-Hinds
2. Hoffman
3. Or approved equivalent.

C. Box Extension Adapter:

1. Hubbell
2. Thomas & Betts
3. Eaton/Crouse-Hinds
4. Or approved equivalent.

2.02 OUTLET BOXES

A. Luminaire Outlet: 4-inch octagonal box, 1-1/2-inches deep with 3/8-inch luminaire stud if required. Provide raised covers on bracket outlets and on ceiling outlets.

B. Device Outlet: Installation of one or two devices at common location, minimum 4-inches square, minimum 1-1/2-inches deep for non-USB type devices. Installation of one or two devices at common locations, minimum 4-inches square, minimum 2-inches deep for USB type devices. Single- or two-gang flush device raised covers.

C. Telecom Outlet: Provide 5-inches square, minimum 2-7/8-inch deep box with two-gang plaster ring.

D. Multiple Devices: Three or more devices at common location. Install one-piece gang boxes with one-piece device cover. Install one device per gang.

E. Masonry Boxes: Outlets in concrete.

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F. Construction: For interior locations, provide galvanized steel outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. All surface mounted outlet boxes are to be drawn. Welded boxes are not acceptable.

G. Accessories: Provide outlet box accessories for each installation, including mounting brackets, wallboard hangers, extension rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

H. Noise Control: Provide acoustic putty pad to back side of each outlet box installed in acoustic rated walls.

2.03 PULL AND JUNCTION BOXES

A. Construction: Provide ANSI 61 gray polyester powder painted sheet steel junction and pull boxes, with screw-on covers; of type shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

B. Location:

1. Provide junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.

2. Provide junction boxes and pull boxes to facilitate installation of conductors and limiting accumulated angular sum of bends between boxes, cabinets and appliances to 270 degrees.

2.04 BOX EXTENSION ADAPTER

A. Construction: Diecast aluminum.

B. Location: Install over flush wall outlet boxes to permit flexible raceway extension from flush outlet to fixed or movable equipment.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate locations of floor boxes and wall mounted wiring device boxes with architectural and structural floor plans prior to rough-in.

B. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1, Standard Practice of Good Workmanship in Electrical Construction.

C. Secure boxes rigidly to substrate upon which they are being mounted.

D. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NEC. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.

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E. Set wall mounted boxes at elevations to accommodate mounting heights shown on Architectural Elevations.

F. Electrical boxes are shown on drawings in approximate locations unless dimensioned.

1. Adjust box locations up to 10-feet if required to accommodate intended purpose.

G. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07, Thermal and Moisture Protection.

H. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

J. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12-inches of box.

K. Box Color Coding and Marking: Reference Section 26 05 53, Identification for Electrical Systems.

L. Adjust boxes to be parallel with building lines. Boxes not plumb to building lines are not acceptable.

M. Install knockout closures in unused box openings.

N. Clean interior of boxes to remove dust, debris, and other material.

O. Clean exposed surfaces and restore finish.

3.02 OUTLET BOXES INSTALLATION

A. Mount outlet boxes, unless otherwise required by ADA, or noted on Drawings, following distances above finished floor:

1. Control Switches:

a. 48-inches to the top of outlet box.

b. 4-inches above top of backsplash at countertops/workstations, not to exceed 44-inches above finished floor to the top of outlet box, per ADA requirements.

2. Receptacles:

a. 15-inches to the bottom of outlet box.

b. 4-inches above top of backsplash at countertops/workstations, not to exceed 44-inches above finished floor to the top of outlet box, per ADA requirements.

3. Telecom Outlets:

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a. Match height of adjacent receptacle.

b. 15-inches to the bottom of outlet box.

c. 4-inches above top of backsplash at countertops/workstations, not to exceed 44-inches above finished floor to the top of outlet box, per ADA standards.

4. Other Outlets: As indicated in other sections of Specifications or as detailed on Drawings.

B. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6-inches from ceiling access panel or from removable recessed luminaire.

C. Flush Outlets in Insulated Spaces: Maintain integrity of insulation and vapor barrier.

D. Coordinate electrical device locations and elevations (switches and receptacles) with architectural drawings to prevent mounting devices in mirrors, back splashes, and behind cabinets.

E. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

F. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices. Adjacent boxes not aligned vertically to be adjusted at no additional cost to Owner.

G. Use flush mounting outlet box in finished areas.

H. Do not install flush mounting box back-to-back in walls; provide minimum 6-inches separation. Provide minimum 24-inches in acoustic rated walls.

I. In acoustical walls, apply acoustic putty pad on outlet box prior to installation of acoustical blanket.

J. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

K. Use stamped steel bridges to fasten flush mounting outlet box between studs.

L. Use adjustable steel channel fasteners for hung ceiling outlet box.

M. Use gang box where more than one device is mounted together. Do not use sectional box.

N. Use gang box with plaster ring for single device outlets.

O. Adjust flush-mounting outlets to make front flush with finished wall material.

3.03 PULL AND JUNCTION BOXES INSTALLATION

A. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

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B. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6-inches from ceiling access panel or from removable recessed luminaire.

C. Do not fasten boxes to ceiling support wires.

D. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.04 BOX EXTENSION ADAPTER INSTALLATION

A. Match material to box.

B. Install gaskets at exterior and wet locations.

END OF SECTION

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SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Equipment Nameplates
2. Device Labels
3. Wire Markers

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals not required for this Section.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
2. Manufacturer's standard products of categories and types required for each application as referenced in other Division 26, Electrical Sections. Where more than a single type is specified for application, provide single selection for each product category.
3. Codes and Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

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PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Equipment Nameplates:

1. B & I Nameplates
2. Intellicum
3. JBR Associates
4. Or approved equivalent.

B. Device Labels:

1. Kroy
2. Brady
3. Or approved equivalent.

C. Wire Markers:

1. Brady
2. Panduit
3. Sumitomo
4. Or approved equivalent.

2.02 EQUIPMENT NAMEPLATES

A. Engraved phenolic plastic, laminate, minimum 1/16-inch thick in the size indicated, with beveled edge border matching letter color. Federal specification LP-387A. All upper case letters in engraver standard letter style of the size and wording indicated. Provide with 2-mil adhesive backing. Embossed tape style labels are not acceptable.

B. Color:

1. Normal (Utility): White letters on black background.
2. Life Safety/Critical (Emergency Systems): Black letters on orange background.
3. Equipment Branch (Legally Required Standby Systems): Black letters on yellow background.

C. Letter Size:

1. Use 1/2-inch letters minimum for identifying major equipment and loads, including switchgear, switchboards, distribution panels, generators, automatic transfer switches, UPS, etc.

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2. Use 1/4-inch letters minimum for identifying panels, breakers, transformers, VFDs, disconnects, etc.

3. Use 3/16-inch minimum for identifying source, voltage, current, phase, wire configurations, and short circuit current rating (SCCR).

D. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

E. The Architect, Engineer, Commissioning Agent and Owner reserve the right to make modifications to the nameplates as necessary.

F. Locations:

1. Switchgear, switchboards, sub-distribution switchboards, distribution panels, branch panels, automatic transfer switches, UPS.

2. Main breakers and distribution breakers in switchgear, switchboards, and distribution panels.

3. Equipment including, but not limited to, motor controllers, disconnects, and VFDs.

4. Distribution transformers.

2.03 DEVICE LABELS

A. Extra strength, laminated adhesive tape with 3/16-inch black letters on clear background. Embossed tape/punch tape style labels are not acceptable.

B. Receptacles: Indicate source panel and source circuits (e.g. xxx-xx).

C. Wall Switches/Control Device Stations:

1. Where controls are provided for remote lighting or power outlets, or where controls in same location serve different purposes or areas, such as corridor and outside, provide device label indicating function of each control device.

2. Label the function of control devices where two or more are mounted in same location and control function may be unclear.

3. Wall switches with engraved buttons do not require labeling.

D. Junction Boxes: Label to show system identification, source circuit, or raceway origin. In finished areas, utilize device label. In unfinished areas or above ceilings, use of permanent ink marker is acceptable.

E. Panel and circuit designation written in permanent marker on the back of the plate and inside all back-boxes and junction boxes.

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2.04 WIRE MARKERS

A. Description: Vinyl-cloth self-adhesive type wire markers.

B. Locations: Each conductor at each load connection.

C. Power and Lighting Circuits: Branch circuit or feeder number as indicated on drawings and source panel.

D. Control Circuits: control wire number indicated on schematic and interconnection diagrams on drawings.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate designations used on Drawings with equipment nameplates and device labels.

B. Install nameplates and labels parallel to equipment lines.

C. Identify empty conduit and boxes with intended use.

D. Provide typewritten branch panel schedules with protective clear transparent covers accounting for every breaker installed. Use actual room designations assigned by name or number near completion of the work, and not the designations shown on Drawings.

3.02 EQUIPMENT NAMEPLATES

A. Degrease and clean surfaces to receive nameplates.

B. Secure equipment nameplates to equipment front using manufacturer adhesive backing.

C. Secure equipment nameplates to inside surface of door on panelboard that is recessed in finished locations.

D. Verify emergency system distribution equipment nameplate colors with Architect/Owner.

E. Switchgear, switchboards, sub-distribution switchboards, distribution panels and branch panels to include name, source, voltage, current, phase, wire configuration, and short circuit current rating (SCCR).

F. Transformers to include source, KVA, and secondary voltage, phase, and wire configuration.

G. Disconnect switches and VFDs to include name, source, and circuit number.

H. Provide nameplates for flush mounted branch panelboards identifying name on front door. On inside of door provide nameplate as noted above. Verify with Architect/Owner if nameplate on outside of door is required.

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I. Provide a second label at branch panelboards listing the means of identification of branch circuit conductors. This identification legend to consist of the color code used for each voltage system (208Y/120V and 480Y/277V). Include identification of both voltage systems on each label, regardless of the voltage of the panelboard to which the label is affixed. Comply with requirements of NEC 210.5.

1. See Specification Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables, for required conductor color code for this project.

3.03 DEVICE LABELS

A. Reference General Installation Requirements above.

B. Install per manufacturer's instructions and recommendations.

C. Degrease and clean surfaces to receive labels. Fingers to be regularly cleaned of grease and debris to prevent fingerprints on labels. Labels installed dirty or with fingerprints to be replaced at no cost to Owner.

3.04 WIRE MARKERS

A. Reference General Installation Requirements above.

B. Install per manufacturer's instructions and recommendations.

C. Provide wire markers on each conductor for power, control, signalling and communications circuits.

END OF SECTION

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SECTION 26 09 25
DIGITAL LIGHTING CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. General Performance
2. Digital Wall or Ceiling Mounted Occupancy Sensor System
3. Digital Wall Switches
4. Room Controllers
5. Digital Photosensors
6. Room Network (DLM Local Network)
7. Configuration Tools
8. Network Bridge
9. Segment Manager
10. Emergency Lighting
11. Source Quality Control

B. System Description and Operation:

1. The Lighting Control and Automation system as defined under this section covers the following equipment:

   a. Digital Room Controllers: Self-configuring, digitally addressable one, two, or three relays controllers with 0-10 volt control for LED drivers (if applicable) and single relay application-specific plug load controllers.

   b. Digital Occupancy Sensors: Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

   c. Digital Switches: Self-configuring, digitally addressable pushbutton switches, dimmers, and scene switches with two-way active infrared (IR) communications.

   d. Digital Photosensors: Single-zone closed loop and multi-zone open loop daylighting sensors with two-way active infrared (IR) communications can provide switching or dimming control for daylighting harvesting.

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e. Configuration Tools: Handheld remote for room configuration provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device/room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow send and receive of room variables and store of occupancy sensor settings. Computer software also customizes room settings.

f. Room Network - Digital Lighting Management (DLM) Local Network: Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.

g. Network Bridge: Provides BACnet MS/TP-compliant digital networked communication between rooms, panels, and the Segment Management or building automation system (BAS).

h. Segment Manager: Provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.

i. Emergency Lighting Control Unit (ELCU): Allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.

C. Lighting Control Applications:

1. Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:

a. Space Control Requirements: Provide occupancy/vacancy sensors with Manual-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling-or corner-mounted sensors and Manual-ON switches.

b. Daylit areas: All luminaires within 15-feet of windows or within 7-feet of skylights (the daylit zones) will be controlled separately from luminaires outside of daylit zones. Luminaires closest to the daylight aperture will be controlled separately from luminaires farther from the daylight aperture, within the daylight zone.

c. Daytime setpoints for total ambient illumination (combined daylight and electric light) level that initiate dimming will be programmed to be not less than 125 percent of the maintained designed illumination levels without outside influence.

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d. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on Drawings.

e. Provide smooth and continuous daylight dimming for areas marked on Drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 01, General Requirements and Section 26 00 00, Electrical Basic Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Layout of sensors indicating their sensing distribution on reproducible Architectural Floor Plans.

2. Shop Drawings: Provide wiring diagrams indicating low voltage and line voltage wiring requirements for occupancy sensors, and each digital lighting control system shown on the electrical drawings.

3. Closeout Submittals:

a. Sustainable Design Closeout Documentation: Lighting Control System Manufacturer to provide Enhanced Start-up documentation that details the start-up procedure being performed including a process to follow, details on tests performed and an area that documents any test results.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Manufacturer: Minimum 10 years experience in manufacture of architectural lighting controls.

2. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.

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3. Lighting Control System Components: Listed by UL specifically for the required loads. Provide evidence of compliance upon request.

4. Prior to adjusting and calibrating daylighting control system and local photocell field adjustable settings, contact local manufacturer representative and arrange for representative to visit site to educate both field installer and Owner's Authorized Representative on the operation of the controls.

5. Use manufacturer's published testing and adjusting procedures to adjust sensors time delay, daylight sensitivity, and passive infrared sensitivity to satisfaction of Owner.

6. Training: Provide minimum 4-hour training session to Owner's Authorized Representatives at a time approved by Owner after Owner has received approved operation and maintenance manuals. Training to include discussion of operation, adjustment, and replacement of sensors, photocells and control.

7. Prepare and complete report of test procedures and results. Submit these test procedures and results to Owner.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wattstopper DLM Series

B. Lutron Quantum Series

C. Acuity nLight

D. Eaton Wavelinx

E. Leviton Lighting Controls

F. Hubbell Control Solutions

G. Or approved equivalent.

H. Basis of Design: Daylighting and occupancy sensor layout on Drawings are designed based on Lutron product line. Approved manufacturers listed below are allowed on condition of meeting specified conditions including complete sensor coverage of area controlled and switching of luminaires in area controlled. Provide additional sensors and room controllers as needed to provide same level of functionality as shown on Drawings. Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

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2.02 GENERAL PERFORMANCE

A. Daylight Harvesting and Occupant Detection to Control Lighting with the Following Hierarchy:

1. Emergency (Highest Priority): Ignores all other inputs.

2. Programming: During system programming, sensor inputs are ignored.

3. Occupant Sensor: Allows lights to be on/off.

4. Daylight Sensor: Imposes a high end limit for light output.

5. Personal Control: Fine tune light levels up to the daylight sensor limit.

B. Response to a single sensor can be unique on luminaire by luminaire basis.

C. Power failure recovery - All devices return to their previous light level prior to power loss.

D. All programmable devices with integral power failure memory to maintain settings for a minimum of 10 hours during power loss.

E. Wall station and sensor replacement accomplished without programming.

2.03 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

A. Wall or Ceiling mounted (to suit installation) dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the system accommodating the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, and accessories which suit the lighting and electrical system parameters.

B. Digital Occupancy Sensors will provide graphic LCD display for digital calibration and electronic documentation. Features include the following:

1. Digital calibration and pushbutton programming for the following variables:

a. Sensitivity: 0-100 percent in 10 percent increments.

b. Time delay: 1-30 minutes in 1 minute increments.

c. Test mode: Five second time delay.

d. Detection technology: PIR, Ultrasonic or Dual Technology activation and/or re-activation.

e. Walk-through mode.

f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

2. Two RJ-45 port(s) for connection to DLM local network.

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3. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

4. Device Status LEDs including:

   a. PIR Detection.

   b. Ultrasonic detection.

   c. Configuration mode.

   d. Load binding.

5. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.

6. Manual override of controlled loads.

C. Units will not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

2.04 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, and 4 button configuration; available in white, light almond, ivory, grey, and black; compatible with wall plates with decorator opening. Wall switches will include the following:

1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

3. Red configuration LED on each switch that blinks to indicate data transmission.

4. Blue Load/Scene Status LED on each switch button with the following characteristics:

   a. Bi-level LED.

   b. Dim locator level indicates power to switch.

   c. Bright status level indicates that load or scene is active.

5. Dimming switches will include seven bi-level LEDs to indicate load levels using 14 steps.

B. Two RJ-45 ports for connection to DLM local network.

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C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

D. The following switch attributes may be changed or selected using a wireless configuration tool:

1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

2. Individual button function may be configured to Toggle, On only, or Off only.

3. Individual scenes may be locked to prevent unauthorized change.

4. Fade Up and Face Down times for individual scenes may be adjusted from 0 seconds to 18 hours.

5. Ramp rate may be adjusted for each dimmer switch.

6. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

2.05 ROOM CONTROLLERS

A. Room controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:

1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

2. Simple replacement - Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.

3. Device Status LEDs to indicate:

a. Data transmission.

b. Device has power.

c. Status for each load.

d. Configuration status.

4. Quick installation features including:

a. Standard junction box mounting.

b. Quick low voltage connections using standard RJ-45 patch cable.

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5. Plenum rated.

6. Manual override and LED indication for each load.

7. Dual voltage (120/277 VAC, 60 Hz).

8. Zero cross circuitry for each load.

B. On/Off/Dimming Enhanced Room Controllers are to include:

1. Real time current monitoring.

2. Three relay configuration.

3. Efficient 250 mA switching power supply.

4. Four RJ-45 DLM local network ports.

5. One 0-10 volt analog output per relay for control of compatible LED drivers.

6. Network Bridge for BACnet MS/TP communications (LMRC-3xx).

7. The following dimming attributes may be changed or selected using a wireless configuration tool:

a. Establish preset level for each load from 0-100 percent.

b. Set high and low trim for each load.

8. Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.

a. One relay configuration only.

b. Automatic ON/OFF configuration.

2.06 DIGITAL PHOTOSENSORS

A. Digital photosensors work with room controllers to provide automatic switching or dimming daylight harvesting capabilities for any load type connected to a room controller. Closed loop photosensors measure the ambient light in the space and control a single lighting zone. Open loop photosensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Photosensors are to be interchangeable without the need for rewiring.

B. Digital photosensors include the following features:

1. An internal photodiode that measures only within the visible spectrum, and has a response curve that closely matches the photopic curve. The photodiode is not to measure energy in either the ultraviolet or infrared spectrums. The photocell is to have a sensitivity of less than 5 percent for any wavelengths less than 400 nanometers or greater than 700 nanometers.

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2. Sensor light level range to be from 1-200 footcandles (fc).

3. The capability of switching one-third, one-half or all lighting ON and OFF, or raising or lowering lighting levels, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).

4. For switching daylight harvesting, the photosensor is to provide a deadband or a separation between the “ON Setpoint” and the “OFF Setpoint” that will prevent the lights from cycling after they turn off.

5. For dimming daylight harvesting, the photosensor is to provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a user-selectable minimum level.

6. Programmable wall switch override to allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise and lower lighting levels for a selected period of time or cycle of occupancy.

7. Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.

8. Red configuration LED that blinks to indicate data transmission.

9. Blue status LED indicates test mode, override mode and load binding.

10. Recessed switch to turn controlled load(s) ON and OFF.

11. One RJ-45 port for connection to DLM local network.

12. An adjustable head and a mounting bracket to accommodate multiple mounting methods and building materials. The photosensor may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox.

C. Open loop digital photosensors include the following additional features:

1. An internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.

2. Automatically establishes setpoints following calibration using a wireless configuration tool or a PC with appropriate software.

3. A proportional control algorithm for dimming daylight harvesting with a “Setpoint” to be maintained during operation.

2.07 ROOM NETWORK (DLM LOCAL NETWORK)

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building. Digital room devices connect to the network using CAT 5e cables with RJ-45 connectors which provide both data and power to room devices. Features of the DLM local network include:

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1. Plug n' Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.

2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.

3. Push n' Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.

2.08 CONFIGURATION TOOLS

A. A configuration tool facilitates optional customization of DLM local networks, and is used to set up open loop daylighting sensors. A wireless configuration tool features infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool to include:

1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.

2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.

3. Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers, and buttons on digital wall switches.

4. Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.

5. Temporarily adjust light level of any load(s)on the local network, and incorporate those levels in scene setting.

6. Adjust or fine-tune daylighting settings established during auto-commissioning, and input light level data to complete commissioning of open loop daylighting controls.

2.09 NETWORK BRIDGE

A. The network bridge connects a DLM local network to a BACnet-compliant network for communication between rooms, panels and a segment manager. Each local network is to include a network bridge component to provide a connection to the local network room devices. The network bridge is to use industry standard BACnet MS/TP network communication.

1. The network bridge may be incorporated directly into the room controller hardware (LMRC-3xx Room Controllers) or be provided as a separate module connected on the local network through an available RJ-45 port.

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2. Provide Plug n' Go operation to automatically discover all room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning is to be required for set up of the network bridge on the local network.

3. The network bridge is to automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. Standard BACnet objects are to be provided as follows:

   a. Read/write the normal or after hours schedule state for the room.

   b. Read the detection state of the occupancy sensor.

   c. Read/write the On/Off state of loads.

   d. Read/write the dimmed light level of loads.

   e. Read the button states of switches.

   f. Read total current in amps, and total power in watts through the room controller.

   g. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings.

   h. Activate a preset scene for the room.

   i. Read/write daylight sensor fade time and say and night setpoints.

   j. Read the current light level, in footcandles, from interior and exterior photosensors and photocells.

   k. Set daylight sensor operating mode.

   l. Read/write wall switch lock status.

2.10 SEGMENT MANAGER

A. The Digital Lighting Management system is to include at least one segment manager to manage network communication. It is to be capable of serving up a graphical user interface via a standard web browser. Each segment manager is to have support for one segment networks as required and allow for control of a maximum of 120 local networks (rooms) and/or lighting control panels per segment network.

B. Operational features of the segment manager to include the following:

   1. Connection to PC or LAN via standard Ethernet TCP/IP.

   2. Easy to learn and use graphical user interface, compatible with Internet Explorer 11 or equal browser.

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3. Log in security capable of restricting some users to view-only or other limited operations.

4. Automatic discovery of all DLM devices on the segment network(s). Commissioning beyond activation of the discovery function is not to be required.

5. After discovery, all rooms and panels to be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.

6. Ability to view and modify room device operational parameters. It is to be possible to set device parameters independently for normal hours and after hours operation.

7. Ability to set up schedules for rooms and panels. Schedules to automatically set controlled zones or areas to either a normal hours or after hours mode of operation.

8. Ability to group rooms and loads for common control by schedules, switches or network commands.

9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.

10. Provide seamless integration with the BAS via BACnet IP.

2.11 EMERGENCY LIGHTING

A. Emergency Lighting Control Unit - A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:

1. 120/277 volts, 50/60 Hz, 20 amp driver rating.

2. Push to test button.

3. Auxiliary contact for remote test or fire alarm system interface.

4. UL2043 plenum rated.

2.12 SOURCE QUALITY CONTROL

A. Perform full-function testing on all completed assemblies at end of line.

B. Diagnostics and Service - Tiered control scheme for dealing with component failure that minimizes loss of control for occupant.

1. Bus Failure: Lights go to emergency level for safety.

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2. Failure of One Sensor Type: Driver still controllable via other sensors.

3. Driver Failure: Only impacts one fixture - remainder of system operates as programmed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's installation instructions and Contract Documents.

B. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.

C. Install photocells as directed by manufacturer's instructions. Complete connections to control circuits, photocells, control modules, power supply pack and low voltage wiring.

D. Verify with manufacturer's representative that sensors and photocells are laid out in compliance to manufacturer's published sensing distribution. Provide additional sensors for complete coverage of space being sensed.

E. Photocell Placement and Wiring:

1. Drawings are schematic, and show photocell quantities together with the daylighting zones that they control.

2. Reference manufacturer installation instructions for the recommended location and orientation of photocell with respect to exterior glazing and both interior and exterior lighting.

3. Ensure that daylight sensor placement minimizes sensors view of electric light sources; ceiling mounted and fixture-mounted daylight sensors are not to have direct view of luminaries.

4. Reposition sensor at no additional cost to Owner to avoid conflict between sensor and object obscuring its view, and between sensor and both interior and exterior lighting that causes daylighting controls to repeatedly increase and decrease in brightness (i.e., "cycling").

5. Field wire photocell for correct footcandle range.

F. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 32 degrees F to 104 degrees F.

2. Relative Humidity: Maximum 90 percent, non-condensing.

G. Lighting control system must be protected from dust during installation.

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H. Prior to applying continuous dimming daylighting controls, maintain LED lighting at full output for a minimum of 100 hours. If this is not done, replace lamps and drivers of affected luminaires at no cost to Owner.

I. Use manufacturer's published testing and adjusting procedures to adjust sensor time delay, daylight sensitivity, and passive infrared sensitivity to satisfaction of Owner.

J. Systems Integration:

1. Equipment Integration Meeting Visit: Owner's Authorized Representative to coordinate meeting with Lighting Control System Manufacturer and other related equipment manufacturers to discuss equipment and integration procedures.

3.02 STARTUP AND PROGRAMMING

A. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:

1. Qualifications for Factory-Certified Field Service Engineer:

a. Minimum experience of two years training in the electrical/electronic field.

b. Certified by the equipment manufacturer on the system installed.

2. Site Visit Activities:

a. Verify connection of power feeds and load circuits.

b. Verify connection of controls.

c. Verify system operation control by control, circuit by circuit.

d. Obtain sign-off on system functions.

e. Demonstrate and educate Owner's Authorized Representative on system capabilities, operation and maintenance.

B. Tech Support: Provide factory direct technical support hotline 24 hours per day, seven days per week.

3.03 FIELD QUALITY CONTROL

A. Manufacturer Services:

1. Aim and Focus Visit: Facility Representative to coordinate on-site meeting with Lighting Control System Manufacturer and Lighting Design Consultant to make required lighting adjustments to the system for conformance with the Lighting Design Consultant's original design intent.

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3.04 CLOSEOUT ACTIVITIES

A. Training Visit: Lighting Control System Manufacturer to provide one day additional on-site system training to site personnel no less than two months after Substantial Completion, separate from start-up and programming visit.

B. On-Site Walk Through: Lighting Control System Manufacturer to provide a factory certified Field Service Engineer to demonstrate system functionality to the Commissioning Agent.

C. Test lighting controls to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with Drawings and Specifications. Provide functional testing of sequences of operation to ensure operation in accordance with Drawings and Specifications. Provide complete report of test procedures and results to engineer and insert approved copy into project closeout documents.

D. Testing Includes:

1. Daylight automatic controls.

2. Occupant sensing automatic controls.

3. Automatic time and override controls for interior lighting.

4. Automatic time and photo controls for exterior lighting.

END OF SECTION

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SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Panelboards

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

B. In addition, reference the following:

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. UL 67, Standards for Panelboards.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Product Data: For each type of panelboard, overcurrent protective device, surge protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

2. Shop Drawings: For each panelboard and related equipment.

a. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

1) Enclosure types and details for types other than NEMA 250, Type 1.

2) Bus configuration, current, and voltage ratings.

3) Short-circuit current rating of panelboards and overcurrent protective devices.

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4) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

b. Wiring Diagrams: Power, signal, and control wiring.

3. Operation and Maintenance Manuals:

a. After completion of work and start-up of the equipment at the project site, deliver to the Owner's Authorized Representative operation instructions, maintenance manuals and drawings presenting full details for care and maintenance of each type of equipment provided under this Contract. Number of copies in accordance with Division 01.

b. Each copy to contain the operating and maintenance information and parts lists for equipment provided under this Contract. When necessary, provide supplemental drawings to show system operation and servicing maintenance points. For electrical components, provide wiring and connection diagrams. Include instructions required to accomplish specified operation and functions. Data to be neat, clean and legible.

c. Panelboard drawings and wiring diagrams to be included and up to date at the completion of start-up and system acceptance by the Owner. Drawings and wiring diagrams to include any field modifications or changes to reflect actual as-installed conditions.

d. In general, the manual to include, but not necessarily be limited to, the following:

1) Panelboard Elevation and One Line.

2) AC and DC Schematic and Physical Component Layout Drawings.

3) Remote Interface Drawing.

4) Bill of Material.

5) Description of Operation.

C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, accessories, and components will withstand seismic forces defined in Section 26 00 00, Electrical Basic Requirements.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

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2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based on their installation requirements.

4. Submit emergency system performance test results per NFPA 110-7.13.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Panelboards:

1. Eaton

2. ABB/General Electric

3. Siemens

4. Basis of Design: Schneider Electric/Square D

5. Or approved equivalent.

B. Manufacturers listed above are allowed on condition of meeting specified conditions including available space for equipment, Code required working clearances, selective coordination per Section 26 05 73, Electrical Distribution System Studies, and amps interrupting capacity (AIC) per short circuit study in Section 26 05 73, Electrical Distribution System Studies. Prior to submitting bid, manufacturer to provide documentation to Engineer verifying specific conditions, including those mentioned above, can be met. Remove and replace electrical equipment installed, at no cost to the Owner, that does not meet these conditions.

2.02 PANELBOARDS

A. Description: Panelboards 400 amps or less. NEMA PB1, Type 1, circuit breaker type. Maximum enclosure depth: 6-inches for surface mounted, 5-3/4-inches for flush mounted.

B. Maximum Width: 20-inches.

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C. Integrated Equipment Rating: Provide fully rated integrated equipment rating greater than the available fault current. Series rated panelboards are not acceptable. Reference drawings for available fault current. If drawings do not have available fault current shown, then coordinate with serving electrical utility. Final rating based on the protective device study completed under the provisions of Division 26, Electrical Distribution System Studies.

D. Panelboard Bus Non-Reduced: Copper, ratings as indicated on drawings. Bus bar with suitable electroplating (tin) for corrosion control at connection. Provide copper ground bus in each panelboard.

E. Lugs: Mechanical type for copper conductors. All device terminals/lugs shall be rated for a minimum of 75 degrees C to facilitate the use of 75 degrees C conductor ampacity rating.

F. Provide double lugs and/or feed-through lugs for feed through feeders.

G. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type/secured connection with frame, with common trip handle for poles; UL listed. Pre-drill bus for bolt-on breakers.

1. Type SWD for lighting circuits.

2. Type HACR for air conditioning equipment circuits.

3. Class A ground fault interrupter circuit breakers where scheduled.

4. Class B ground fault equipment protection circuit breakers for heat trace and other circuits as required by Code. Provide shunt trip circuit breakers where scheduled; provide wiring to remote trip switch/contacts as indicated on Drawings.

5. Do not use tandem circuit breakers.

H. Cabinet Front: Provide flush or surface mounting as shown on the schedules, drawings, or otherwise noted. Cabinet front with concealed hinged front cover construction, metal directory frame with heavy clear plastic protector, flush lift latch and lock, two keys per panel all keyed alike.

I. Provide boxes with removable blank end walls and interior mounting studs. Provide interior support bracket for ease of interior installation.

J. Furnish surface mounted cabinet boxes without knockouts.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install panelboards in accordance with NEMA PB 1.1, NECA 1 and manufacturer's installation instructions.

B. Install panelboards level and plumb. Install recessed panelboards flush with wall finishes.

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C. Height: 6-feet 6-inches to top of panelboard; install panelboards taller than 6-feet 6-inches with bottom no more than 4-inches above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard. Include all "spaces" and "spares." Revise directory to reflect circuiting changes and as-installed conditions. Use final Owner designated room names and numbers, and not designations shown on drawings.

F. Provide engraved plastic nameplates per Section 26 05 53, Identification for Electrical Systems.

G. Provide arc flash labels.

H. Provide concrete housekeeping pad for floor-mounted distribution panelboards. Extend 6-inches beyond distribution panel width and depth dimensions. Minimum 3-inches above finished floor. Install plumb and level.

I. Provide two 1-inch spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

J. Provide permanent identification number in or on panelboard dead-front adjacent to each breaker pole position. Horizontal centerline of numbers to correspond with centerline of circuit breaker pole position.

K. Ground and bond panelboard enclosure per NEC.

L. Paint:

1. Standard factory finish unless noted otherwise.

2. Panelboards located in finished interior areas in view of building occupants; paint to match adjacent wall surface. Color and paint preparation as specified by Architect. Covers to be painted off wall, then installed over dried, painted wall surface.

M. Provide handle guards on each circuit supplying obviously constant loads such as fire alarm, security, lighting controls, refrigerators and freezers, fire protection, etc.

N. Provide interior wiring diagram, neutral wiring diagram, UL label, and short circuit rating on interior or in booklet format inserted in sleeve inside panel cover.

O. Verify available recessing depth and coordinate wall framing with other divisions.

P. Maintain fire rating of wall where panels are installed flush in fire rated walls.

Q. Perform inspections and tests in accordance with manufacturer's requirements.

R. Thoroughly clean exterior and interior of each panelboard in accordance with manufacturer's installation instructions.

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S. Vacuum construction dust, dirt, and debris out of each panelboard.

T. Where enclosure finish is damaged, touch up finish with matching paint in accordance with manufacturer's specifications and installation instructions.

3.02 PANELBOARDS INSTALLATION

A. Breakers being added to existing panelboards: Coordinate breaker type and short circuit rating with existing panelboard. Breakers to match existing in manufacturer's type and AIC rating. Provide new typed circuit directory.

B. Provide handle tie to branch circuit breakers of multiwire branch circuits for simultaneous disconnection of circuits. Handle tie will be identified for use with circuit breakers provided. Reconfigure assigned circuits as necessary so that circuit breakers associate with multiwire branch circuits are physically adjacent, record changes in panelboard schedules and circuiting plans for record drawings.

C. Shunt Trip Circuit Breakers: Provide wiring to remote trip switch/contacts as indicated on Drawings.

D. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

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SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: Provision of materials, installation and testing of:

1. Wall Switches
2. Finish Plates
3. Surface Covers

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Wall Switches
2. Wall Plates
3. In-Use Cover

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Wall Switches:

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1. Toggle Type:
    a. Cooper
    b. Hubbell
    c. Leviton
    d. Legrand
    e. Or approved equivalent.

B. Finish Plates:
    1. Bryant
    2. Cooper
    3. Hubbell
    4. Leviton
    5. Legrand P&S
    6. Or approved equivalent.

C. Surface Covers:
    1. While-in-Use Weatherproof Outlet Cover:
        a. Die Cast Cover:
            1) Intermatic
            2) Hubbell
            3) Leviton
            4) Cooper
            5) Or approved equivalent.

D. Provide lighting switches and receptacles of common manufacturer and appearance.

2.02 WALL SWITCHES

A. Characteristics: Toggle type, quiet acting, 20 amp, 120/277 volt, UL listed for motor loads up to 80 percent of rated amperage, extra heavy duty.

B. Finish: Match Building Standard.

2.03 FINISH PLATES

A. Finish Plates: Type 302 stainless steel with smooth satin finish.

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2.04 SURFACE COVERS

A. Material: Galvanized steel, drawn, 1/2-inch raised industrial type with openings appropriate for devices installed on surface receptacles.

B. Cast Box and Extension Adaptors: Aluminum with gasket, blanks single-gang.

C. While-in-Use Weatherproof Cover: NEMA 3R when closed over energized plug. Vertical mount for duplex receptacle. Provide continuous use cover with cover capable of closing over energized cord cap with bottom aperture for cord exit.

1. Die cast cover with closed cell neoprene foam gasket: Capable of being locked closed to prevent tampering or unauthorized use.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. See Architectural elevations for location and mounting height of wiring devices. Review Architectural elevations prior to rough-in and contact Architect immediately if conflicts are found between Architectural and Electrical Drawings. Do not rough-in devices until conflicts are resolved.

B. Install wiring devices and finish plates plumb with building lines, equipment cabinets and adjacent devices. Devices not plumb will be fixed at no additional cost to Owner.

C. Orientation:

1. Install wiring devices with long dimension oriented vertically at centerline height shown on drawings or as specified.

2. Vertical Alignment: When more than one device is shown on Drawings in close proximity to each other, but at different elevations, align devices on a common vertical center line for best appearance. Verify with Architect.

3. Horizontal Alignment: When more than one device is shown on drawings in close proximity to each other with same elevation, align devices on a common horizontal center line for best appearance. Verify with Architect.

D. Provide labeling per Section 26 05 53, Identification for Electrical Systems.

E. Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements. Test receptacles for line to neutral, line to ground and neutral to ground faults. Correct any defective wiring.

3.02 WALL SWITCHES INSTALLATION

A. At time of substantial completion, replace those items which have been damaged.

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3.03 FINISH PLATES INSTALLATION

A. Do not install items until finish painting is complete. Replace scratched and paint splattered finish plates and wiring devices.

3.04 SURFACE COVERS INSTALLATION

A. Do not install items until finish painting is complete. Replace scratched and paint splattered finish plates and wiring devices.

END OF SECTION

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SECTION 26 33 23
CENTRAL BATTERY EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Components

2. Accessories

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Include battery product data.

2. Shop drawings to include battery interconnection schematic diagrams, block diagrams of interconnection of internal elements, input terminals and output circuit breakers.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Manufacturer qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience with service facilities within 100 miles of project.

1.06 WARRANTY

A. Warranty of materials and workmanship as outlined in Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

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1.07 SYSTEM DESCRIPTION

A. Modular battery source inverter system complete with charger, transfer mechanism, integral maintenance bypass and output circuit breakers for purpose as emergency egress lighting backup power sources.

B. IGBT-based, PWM inverter, 16 kHz switch speed. Suitable for HID, fluorescent and incandescent loads. Recombinant VRLA batteries.

C. Provide two classes of output, one continuously energized, one energized only upon failure of input source.

D. Meets UL 924, NFPA 101 and NFPA 111. Materials and installation compliant with state and local adopted Fire Code.

1.08 PERFORMANCE

A. Environmental Conditions Required: 68 to 85 degrees F for batteries.

B. Minimum throughput efficiency: 86 percent.

C. Maximum Audible Noise: 52dBA.

D. Maximum THD: less than 10 percent at full resistive load.

E. Unit Power Capacity: 4.8 KW.

F. Unit Input Voltage: 120 volts, single-phase, 2-wire.

G. Inverter output frequency: 60 Hz plus 1 percent.

H. Unit Output Voltage: 120 volts, single-phase, 2-wire.

I. Maximum recharge time: 12 hours following 1.5 hour discharge.

J. Physical Size: Maximum 36-inches wide by 72-inches high by 24-inches deep per cabinet. Two cabinets for unit power capacity cited above.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Single Phase:

1. Chloride - Synthesis Series

2. Dual-Lite - Spectron LSN Series

3. On-Line Power - Power Wave Series

4. Sure-Lites - Lifeway Series

5. Trystar - UltraLITE Series

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6. Trystar - eLITE Series

7. Myers Emergency Power Systems - Illuminator Series

8. Perfect Power Systems - Power Ride Series

B. Three Phase:

1. Dual-lite - Trident TRF Series

2. On-Line Power - Power Wave Series

3. Sure-Lites - Lifeway Series

4. Trystar - EON Series

5. Trystar - TrueLITE Series

6. Myers Emergency Power Systems - Illuminator Series

7. Perfect Power Systems - Power Ride Series

C. Basis of Design: Battery source inverter system on Drawings is designed based on Myers product line. Approved manufacturers are allowed on condition of meeting specified conditions including available space for equipment (including Code required working clearances). Remove and replace electrical equipment installed not meeting these conditions at no cost to Owner.

2.02 COMPONENTS

A. Cabinet:

1. Welded steel, 12 gauge, constructed to NEMA-1 Specifications. Front and back accessibility. Convection cooling vents in enclosure.

2. Corrosion resistant paint finish.

3. Hinged, lockable doors.

B. Inverter:

1. Pulse-width modulated power supply based on IGBT transistors. Dual-conversion with no interruption to load.

2. Internal maintenance bypass switch, make-before-break.

3. Overload protection by static bypass switch; system rated to 42,000A symmetric short circuit.

4. Visual indicator (LED) to indicate inverter operation.

5. Each module protected against reverse battery polarity.

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6. Each module includes an encapsulated ferroresonant transformer, UL Class H insulation.

C. Charger:

1. Dual rate design. Constant current voltage limited high rate charge followed by precision float voltage charge for maximum battery capability and life. Charger is temperature compensating to prevent thermal runaway condition with batteries.

2. Capable of fully recharging batteries within 12 hours following any rated discharge.

3. Reverse polarity protected.

4. Provide fuse protection for system DC input and charger AC input and DC output.

D. Monitor:

1. Monitor AC input for brownout or failure condition. Transfer to battery source when AC input voltage drops below 80 percent of nominal voltage.

2. Transfer time 30 to 80 milliseconds.

3. Low battery voltage shutdown set at 87.5 percent of nominal voltage.

E. Return to Normal Source: Two-minute time delay return to normal source once normal source has been reestablished.

F. Recombinant VRLA Batteries: Sufficient capacity to output voltage of the inverter for a period of at least 90 minutes at a rated load, without dropping below 87.5 percent nominal battery voltage. 10-year, sealed, lead-calcium. Requires no addition of water over life of battery. Construct case and cover of polypropylene, contain low-pressure safety release vents, and be non-gassing in normal use. 10-year design life expectancy at 77 degrees F. VRLA batteries to include self-resealing flame-arresting caps.

G. Output Regulation:

1. 60 Hz plus or minus 1 Hz.

2. Voltage regulation, plus or minus 6 percent or less from 0 percent to 100 percent of rated load.

2.03 ACCESSORIES

A. Status and Alarm Condition Monitor:

1. LCD Display to Include:

a. AC input voltage.

b. DC charger current.

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c. Output power VA.

d. AC output amps.

e. DC battery voltage.

f. System temperature.

g. Output frequency.

2. Test switch to allow manual test of system without interrupting power to load.

3. Audible alarm and silence switch to monitor charger and inverter malfunctions and battery electrolyte level.

4. Remote annunciator as indicated on Drawings.

B. Output circuit breakers, including normally on circuit breakers, as indicated on Drawings.

C. Self-Diagnostics:

1. System to test for 5 minutes every 30 days and for 30 minutes every 6 months. An audible and visible alarm to activate upon:

a. Utility failure.

b. High temperature.

c. Inverter failure.

d. Charger failure.

e. System overload.

f. Output trip alarm.

2. Output to e-mail for notices to Owner during alarm and trouble conditions.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with manufacturer's instructions.

B. Provide a level dry protected area with stable temperature conditions. Install units plumb and level.

C. Batteries: Install batteries with acid neutralization pillow installed under each battery housing (comply with IFC 608.5.2 or local adopted Fire Code, whichever is more stringent). Enviroguard VRLA Pads or approved equal.

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D. Room installation: Provide room containing central battery system with signage, automatic smoke detection tied to central system (see Division 28) as required by IFC Section 608 or local adopted Fire Code, whichever is more stringent.

E. Schedules:

1. Provide output circuit schedule indicating loads connected to each output circuit breaker.

F. Training:

1. Provide Owner with minimum 4-hour training session, presented by factory technician, on use and maintenance of battery power system. Videotape training session for future use by Owner.

2. Verify operation of each unit by simulating outage.

G. Verify operation of each unit by simulating outage.

3.02 COMPONENTS

A. Install per manufacturer's written instructions and requirements.

B. See General Installation Requirements above.

C. Provide interconnection between cabinets. Secure cabinets with seismic restraint in accordance with IBC seismic zone classification of area. Confirm requirements with Architect.

D. Comply with manufacturer's recommendations prior to start-up to prevent physical and electrical damage to components.

3.03 ACCESSORIES

A. Install per manufacturer's written instructions and requirements.

B. See General Installation Requirements above.

C. Connect pager, cell phone, fax to dial phone number as directed by Owner, printing out status report during alarm or trouble condition.

1. Utility power is lost.

2. Fire alarm system goes into alarm.

3. Security system goes into alarm.

END OF SECTION

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SECTION 26 51 00
LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Luminaires
2. LED Drivers
3. Lamps

B. Provide wiring for complete and operating lighting system.

1.02 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. NECA 500 - Commercial Lighting.
2. UL 8750 - Light Emitting Diode (LED) equipment for use in lighting products.

1.04 SUBMITTALS

A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

1. Submit product data for:

a. LED Luminaires: Electrical ratings, dimensions, mounting, material, clearances, terminations, wiring, connection diagram, LM-79 photometric data, LM-80 lumen depreciation data.

b. LED Drivers

c. Lamps

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2. Submittal Cutsheets: Highlight, circle or otherwise graphically indicate which option(s) are being selected for the products submitted. Cutsheets that are not edited to indicate which products and options are submitted for this project or that list only catalog numbers to identify submitted options are not acceptable.

3. Specified manufacturers are approved to submit bid. However, inclusion does not relieve manufacturer from supplying product as described.

4. Provide the following operating and maintenance instructions as required by Section 26 00 00, Electrical Basic Requirements:

   a. Luminaires

   b. LED Drivers

   c. Lamps

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Provide luminaires acceptable to code authority for application and location installed.

2. Comply with applicable ANSI standards.

3. Comply with applicable NEMA standards.

4. Provide luminaires and lampholders that comply with UL standards and have been listed and labeled for location and use indicated by a testing agency acceptable by the AHJ (e.g., UL, ETL, and the like).

5. Comply with OESC as applicable to installation and construction of luminaires.

6. Comply with fallout and retention requirements of OSSC for diffusers, baffles, and louvers.

7. Provide LED luminaires from the same manufacturer and manufacturing LED source batch for similar applications (e.g., all LED downlights from a single manufacturer and batch, all linear LED products from single manufacturer and batch).

1.06 WARRANTY

A. Warranty as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, provide:

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1. LED Luminaire Manufacturer's Warranty: Not less than 5 years for luminaire based on date of substantial completion. Includes normal cost of labor to replace luminaire. Replacement luminaire will match physical dimensions, physical appearance, chromaticity, lumen output and photometric characteristics of original installed equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Luminaires:

1. Reference description and manufacturers in Luminaire Schedule on Drawings.

2. Or approved equivalent.

B. LED Drivers:

1. Indoor Drivers:

a. eldoLED Series

b. Advance/Philips

c. Osram Sylvania

d. Or approved equivalent.

2. Outdoor Drivers:

a. Advance/Philips

b. Osram Sylvania

c. LG

d. Or approved equivalent.

C. Lamps:

1. LED (Light Emitting Diode) Lamps:

a. Nichia

b. Cree

c. Osram Sylvania

d. GE Lumination

e. Or approved equivalent.

2. Unless specific manufacturer not shown on this list is indicated in the Luminaire Schedule.

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3. Special types as indicated in Luminaire Schedule.

4. Or approved equivalent.

2.02 LUMINAIRES

A. Luminaires: Reference description and manufacturers in Luminaire Schedule on Drawings.

B. Where recessed luminaires are installed in cavities intended to be insulated, provide IC rated luminaires or other code approved installation.

C. UL label luminaires installed under canopies, roof or open porches, and similar damp or wet locations, as suitable for damp or wet location.

D. Suspended luminaires: Provide minimum 24-inch adjustability in aircraft cable length where used.

E. Recessed Luminaires: Frame compatible with ceiling material installed at particular luminaire location. Provide proper factory trim and frame for luminaire to fit location and ceiling material. Verify with Architectural Reflected Ceiling Plan prior to submittals.

F. Finishes:

1. Manufacturer's standard finish (unless otherwise indicated) over corrosion resistant primer.

2. Interior Light Reflecting Finishes: White or specular finish with not less than 85 percent reflectance.

3. Exterior Finishes: As detailed in Luminaire Schedule or on Drawings. Refer cases of uncertain applicability to Architect for resolution prior to release for fabrication.

G. Light Transmitting Components:

1. Plastic diffusers, molded or extruded of 100 percent virgin acrylic.

2. Prismatic acrylic, extruded, flat diffusers, 0.125-inch overall thickness, unless otherwise noted.

H. LED Luminaires:

1. UL listing of luminaire includes drivers, transformers, enclosures, rated wire, communications devices and accessories needed for a complete and functional system.

2. LM-79: Testing and measurement of absolute photometry, chromaticity (CCT) and luminaire power. Report provided by DOE certified independent testing laboratory. CCT as specified in Luminaire Schedule.

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3. Standards: ANSI C78.377, LM-79 and LM-82 compliant for performance characteristics, photometry, colorimetry, efficacy and thermal characteristics.

4. LM-80 + TM-21: Testing and measurement, and statistical prediction of LED lamp life. Report provided by DOE certified independent testing laboratory.

5. LEDs in one module/luminaire: Supplied from same batch/bin and fall within 3-step MacAdam Ellipse, or as described in Luminaire Schedule, whichever is the more stringent requirement.

6. Provide luminaires with integral LED thermal management system (heat sinking).

7. Luminaires to be equipped with an LED driver that accepts 120V through 277V, 50Hz to 60Hz (universal). Component-to-component wiring within the luminaire will carry no more than 80 percent of rated current and be listed by UL for use at 600VAC at 302 degrees F/150 degrees C or higher. Plug disconnects to be listed by UL for use at 600VAC, 15A or higher.

8. Provide luminaires with individual LED arrays/modules and drivers that are accessible and replaceable from exposed side of the luminaire.

2.03 LED DRIVERS

A. General:

1. Performance: Meet dimming range called out in Luminaire Schedule, free from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, and stable when input voltage conditions fluctuate over what is typically experienced in a commercial environment. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.

2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.

3. Minimum efficiency of 85 percent, power factor greater than or equal to 0.90, compliance with reduction of hazardous substances (RoHS). Rated for operating temperature range of area in which driver is installed.

4. Limit inrush current to minimize breaker tripping.

   a. Base specification: NEMA 410 standard for inrush current for electronic drivers.

   b. Preferred Specification: Meet or exceed 30 milliamp-squared-seconds at 277VAC for up to 50 watts of load and 75 amps at 240 microseconds at 277VAC for 100 watts of load.

5. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.

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6. No visible change in light output with a variation of plus/minus 10 percent line voltage input.

7. Total Harmonic Distortion less than 10 percent and meet ANSI C82.11 maximum allowable THD requirements at full output. THD at no point in the dimming curve allows imbalance current to exceed full output THD.

8. Support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:

   a. Adjustment of forward LED voltage, supporting 3V through 55V.

   b. Adjustment of LED current from 150mA to 1.4A at the 100 percent control input point in increments of 1mA.

   c. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.

9. Operate for a (+/- 10 percent) supply voltage of 120V through 277VAC at 60Hz.

10. UL Recognized under the component program and modular for simple field replacement. Drivers that are not UL Recognized or not suited for field replacement will not be considered.

11. Ability to provide no light output when the analog control signal drops below 0.3 V, or the DALI/DMX digital signal calls for light to be extinguished and consume 0.5 watts or less in this standby. Control dead band between 0.3V and 0.65V included to allow for voltage variation of incoming signal without causing noticeable variation in luminaire to luminaire output.

B. Light Quality:

1. Over the entire range of available drive currents, driver to provide step-free, continuous dimming to black from 100 percent to 0.1 percent and 0 percent relative light output, or 100 percent to 1 percent light output and step to 0 percent where indicated. Driver to respond similarly when raising from 0 percent to 100 percent.

   a. Driver must be capable of 20 bit dimming resolution for white light LED drivers or 15 bit resolution for RGBW LED drivers.

2. Driver must be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels.

3. Drivers to track evenly across multiple luminaires at all light levels, and must have an input signal to output light level that allows smooth adjustment over the entire dimming range.

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4. Driver and luminaire electronics to deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100 percent to 0.1 percent luminaire will have:

   a. LED dimming driver to provide continuous step-free, flicker free dimming similar to incandescent source.

   b. Base specification: Based on IEEE PAR1789, minimum output frequency should be greater than 1250 Hz.

   c. Preferred specification: Flicker index to be equal to incandescent, less than 1 percent at all frequencies below 1000 Hz.

C. Control Input:

1. Provide control protocol to match lighting control system specified for use with luminaire.

2. 4-Wire (0-10V DC Voltage Controlled) Dimming Drivers:

   a. Meet IEC 60929 Annex E for General White Lighting LED drivers.

   b. Connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6 ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.

   c. Meet ESTA E1.3 for RGBW LED drivers.

2.04 LAMPS

A. Provide lamps for luminaires.

B. Provide lamp catalogued for specified luminaire type.

C. Incandescent Lamps: Not allowed unless noted in Luminaire Schedule.

D. LED (Light Emitting Diode):

1. LED manufacturer will include, but not be limited to, light source, luminaire, power supply and control interface with added components as needed for complete and functioning system.

   a. Comply with ANSI chromaticity standard for classifications of color temperature. See Luminaire Schedule for specified LED lamp color and color temperature. UL or ETL listed and labeled.

   b. Luminaire testing per IESNA LM-79 and LM-80 procedures.

   c. Lamp life for white LEDs: 50,000 plus hours with lamp failure occurring when LED produces 70 percent of initial rated lumens.

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d. Lamp life for color LEDs: 30,000 plus hours with lamp failure occurring when LED produces 50 percent of its initial rated lumens.

e. LED Drivers: Reverse polarity protection, open circuit protection, require no minimum load. Minimum 80 percent efficiency. Class A noise rating.

f. Dimming: LED system capable of full and continuous dimming.

g. Correlated Color Temperature (CCT): See Luminaire Schedule for selection of color temperature for each luminaire. Ranges given below reflect maximum allowable tolerances for color temperature range for each nominal CCT.

1) Nominal CCT:

(a) 2700 K (2725 ± 145)

(b) 3000 K (3045 ± 175)

(c) 3500 K (3465 ± 245)

(d) 4000 K (3985 ± 275)

h. Color Rendering Index (CRI) to be greater than or equal to 80.

2. Special types as indicated in Luminaire Schedule.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install per manufacturer's written installation instructions and requirements.

B. Install luminaires securely, in neat and workmanlike manner.

C. Install luminaires of types indicated where shown and at indicated heights in accordance with manufacturer's written instructions and with recognized industry practices to ensure that luminaires comply with requirements and serve intended purposes.

D. Wiring:

1. Recessed luminaires to be installed using flexible metallic conduit or MC Cable as allowed by Section 26 05 19 with luminaire conductors spliced to branch circuit conductors in nearby accessible junction box over ceiling. Junction box fastened to building structural member within 6-feet of luminaire.

2. Luminaires for lift out and removal from ceiling pattern without disconnecting conductors or defacing ceiling materials.

3. Flexible connections where permitted to exposed luminaires; neat and straight, without excess slack, attached to support device.

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4. Install junction box, flexible conduit and high temperature insulated conductors for through wiring of recessed luminaires.

E. Relamp luminaires which have failed lamps at substantial completion.

F. Replace LED drivers deemed as excessively noisy by Architect, Engineer, or Owner.

G. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

H. Support luminaires larger than 2- by 4-foot size independent of ceiling framing.

I. Locate recessed ceiling luminaires as indicated on architectural reflected ceiling plan.

J. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

K. Exposed Grid Ceilings:

1. Support surface mounted luminaires in grid ceiling directly from building structure.

2. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.

3. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.

L. Install recessed luminaires to permit removal from below.

M. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

N. Install clips to secure recessed grid-supported luminaires in place.

O. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Architectural Drawings.

P. Install accessories furnished with each luminaire.

Q. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

R. Bond products and metal accessories to branch circuit equipment grounding conductor.

S. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

T. Where manufactured wiring assemblies are used, ensure that wiring assembly manufacturer sends components to appropriate luminaire manufacturer for respective installation of proper components.

U. Coordination:

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1. Coordination of Conditions: Coordinate ceiling construction, recessing depth and other construction details prior to ordering luminaires for shipment. Refer cases of uncertain applicability to Architect for resolution prior to release of luminaires for shipment. Where luminaires supplied do not match ceiling construction, replace luminaires at no cost to Owner.

2. Electrical drawings are schematic, identifying quantity and type of luminaires used and their approximate location, but are not to be used for dimensional purposes. Reference architectural drawings for exact locations, including mounting heights.

3. Provide lighting indicated on Drawings with luminaire of the type designated and appropriate for location.

4. Provide LED luminaires with driver compatible to lighting control system as shown in drawings and as specified.

5. Where remote drivers are required, ensure adequate accessibility to driver. Upsize conductors between luminaire and driver to accommodate voltage drop.

V. Field Quality Control:

1. Perform field inspection in accordance with Division 01, General Requirements.

2. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

W. Cleaning:

1. Clean electrical parts to remove conductive and deleterious materials.

2. Remove dirt and debris from enclosures.

3. Clean paint splatters, dirt, dust, fingerprints, and debris from luminaires.

4. Clean photometric control surfaces as recommended by manufacturer.

5. Clean finishes and touch up damaged finishes per by manufacturer's instructions.

X. Demonstrate luminaire operation for minimum of two hours.

3.02 LUMINAIRES INSTALLATION

A. Install per manufacturer's written installation instructions and requirements.

B. Align, mount and level luminaires uniformly. Use ball hangers for suspended stem mounted luminaires.

C. Avoid interference with and provide clearance from equipment. Where indicated locations for luminaires conflict with locations for equipment, change locations for luminaire by minimum distance necessary as directed by Architect.

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D. Suspended Luminaires: Mounting heights indicate clearances between bottom of luminaire and finished floors.

E. Emergency Egress Luminaires: Provide unswitched circuit for battery charging and autotransfer circuiting for exit signs and luminaires with integral batteries.

F. Interior Luminaire Supports:

1. Support Luminaires: Anchor supports to structural slab or to structural members within a partition, or above a suspended ceiling.

2. Maintain luminaire positions after cleaning and relamping.

3. Support luminaires without causing ceiling or partition to deflect.

4. Provide mounting supports for recessed and pendant mounted luminaires as required by IBC.

G. Adjusting:

1. Aim and adjust luminaires as indicated.

2. Focus and adjust floodlights, spotlights and other adjustable luminaires, with Architect, at such time of day or night as required.

3. Align luminaires that are not straight and parallel/perpendicular to structure.

4. Position exit sign directional arrows as indicated.

3.03 LED DRIVERS INSTALLATION

A. Install lamps per manufacturer's installation instructions and requirements.

B. Where driver is remote mounted, size wiring based on type of driver, driver distance from luminaire, and voltage/power level, and manufacturer's installation instructions.

C. Protect 0-10V input from line voltage mis-connection, and so it will be immune and the output unresponsive to induced AC voltage on the control leads.

END OF SECTION

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ABBREVIATIONS

@	AT
&	AND
#	NUMBER / POUND
CL	CENTERLINE
AB	ANCHOR BOLT
AC	AIR CONDITIONING
ACT	ACOUSTICAL CEILING TILE
AD	AREA DRAIN
ADJ	ADJUSTABLE /ADJACENT
AFF	ABOVE FINISH FLOOR
ALT	ALTERNATE
ALUM	ALUMINUM
ANOD	ANODIZED
APPROX	APPROXIMATE(LY)
AUTO	AUTOMATIC
AWP	ACOUSTICAL WALL PANEL
B	BASE
BD	BOARD
BL	BUILDING LINE
BLDG	BUILDING
BLKG	BLOCKING
BM	BEAM
BO	BOTTOM OF/ BY OTHERS
BOT	BOTTOM
BSMT	BASEMENT
BTW	BETWEEN
C	CHANNEL
CAB	CABINET
CIP	CAST IN PLACE
C.H.	CEILING HEIGHT
CJ	CONST JOINT /CONTROL JOINT
CLG	CEILING
CLR	CLEAR(ANCE)
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CONST	CONSTRUCTION
CONT	CONTINUOUS
COORD	COORDINATE
CORR	CORRIDOR
CT	CERAMIC TILE
CTR	CENTER
D	DEPTH
DBL	DOUBLE
DEMO	DEMOLISH
DEPT	DEPARTMENT
DET	DETAIL
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DN	DOWN
DR	DOOR
DS	DOWNSPOUT
DW	DISHWASHER
DWG	DRAWING
E	EAST
EA	EACH
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
ENCL	ENCLOSURE
EQ	EQUAL
EQUIP	EQUIPMENT
EXIST	EXISTING
EXT	EXTERIOR
FA	FIRE ALARM
FC	FINISH COATING
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FDN	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF	FINISH FLOOR
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FIN	FINISH
FL	FLOOR
FO	FACE OF
FOC	FACE OF CONCRETE
FR	FIRE RATED
FRT	FIRE RETARDANT TREATED
FT	FOOT OR FEET
FTG	FOOTING
G	GALV GALVANIZED
GFRC	GYPSUM FIBER REINFORCED CONCRETE
GND	GROUND
GWB	GYPSUM WALL BOARD
GYP	GYPSUM
H	HIGH / HARDENER
HC	HOLLOW CORE / HANDICAPPED
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HR	HOUR
HT	HEIGHT
HVAC	HEATING / VENTILATING /AIR CONDITIONING
HW	HOT WATER
INCL	INCLUDE /INCLUDING
INSUL	INSULATION
INT	INTERIOR
INV	INVERT
J.C.	JANITOR'S CLOSET
KD	KNOCKDOWN
KIT	KITCHEN
L	LENGTH / LINOLEUM
LAV	LAVATORY
LB	POUND
MAT	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MEZZ	MEZZANINE
MIN	MINIMUM / MINUTE
MISC	MISCELLANEOUS
MTD	MOUNTED
MTL	METAL
N	NORTH
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
OC	ON CENTER
OCC	OCCUPANCY
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OH	OVERHEAD
OH	OPPOSITE HAND
ORD	OVERFLOW ROOF DRAIN
OPNG	OPENING
OPP	OPPOSITE
PL	PROPERTY LINE /PLATE
PLY.	PLYWOOD
PREFAB	PREFABRICATED
PREFIN	PREFINISHED
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	PRESSURE TREATED / POST TENSION / POINT/PAINT
PTD.	PAPER TOWEL DISPENSER
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
R	RADIUS / RISER
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
REF	REFER(ENCE)
REINF	REINFORCE(D)(ING)
REQ'D	REQUIRED
REV	REVISE(D)(ION)
RM	ROOM
RO	ROUGH OPENING
ROW	RIGHT OF WAY
S	SOUTH / SEALER
SC	SOLID CORE / SPECIAL COATING
SCHED	SCHEDULE
SD	STORM DRAIN
SECT	SECTION
SF	SQUARE FEET
SGL	SINGLE
SHT	SHEET
SHTG	SHEATHING
SIM	SIMILAR
SPKLR	SPRINKLER
SPKR	SPEAKER
SQ	SQUARE
SS	STAINLESS STEEL / SANITARY SEWER
ST	STREET / STONE
STD	STANDARD
STL	STEEL
STOR	STORAGE
SYM	SYMMETRICAL
T	TREAD
T & B	TOP AND BOTTOM
T & G	TONGUE AND GROOVE
TBD	TO BE DETERMINED
TOC	TOP OF CURB /CONCRETE
TEL	TELEPHONE
TEMP	TEMPORARY
THK	THICK(NESS)
TO	TOP OF
TV	TELEVISION
TYP	TYPICAL
UNO or UON	UNLESS NOTED OTHERWISE
U.O	UNDERSIDE OF
U.L.	UNDERWRITER'S LABORATORY
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
V.I.F.	VERIFY IN FIELD
VT	VINYL TILE
W	WEST
W/	WITH
W/D	WASHER/DRYER
W/O	WITHOUT
WC	WATER CLOSET
WD	WOOD
WF	WOOD FLOORING / WIDE FLANGE
WP	WATERPROOFING

SYMBOLS

AREA TAG — ROOM NAME / 150 SF

BUILDING SECTION — 1 / A1.01 / SIM

EXTERIOR ELEVATION — 1 REF / 1 REF / A101 / 1 REF / 1 REF

VIEW TITLE — A1.01 / VIEW NAME / 1/8" = 1'-0"

EXIT SYMBOL

CENTERLINE

SPOT ELEVATION — + CROSSHAIR / TARGET

GRID HEAD — 0

NORTH ARROW — N

LEVEL HEAD — NAME / ELEVATION

CALLOUT HEAD — SIM / 1 / A1.01

WALL SECTION — 1 / A1.01 / SIM

INTERIOR ELEVATION — 1 REF / 1 REF / A101 / 1 REF / 1 REF

WALL TAG — A 4 a / 1 | 8

REVISION TAG

DOOR TAG — 101

STAIR TAG — 20R @7 1/2"

KEYNOTE — 7

ROOM TAG — ROOM NAME / 101

VIEW REFERENCE — 1/A1.00

DRAWING INDEX

CS-01	COVER SHEET	M2.1	FLOOR PLAN - MECHANICAL
G1.0	GENERAL NOTES, FIRE LIFE SAFETY CODE SUMMARY	P0.1	SYMBOL LIST - PLUMBING
		P2.1	FLOOR PLAN- PLUMBING
A2.0	DEMOLITION FLOOR PLAN	E0.1	SYMBOLS LIST & NOTES - ELECTRICAL
A2.1	FLOOR PLAN AND DOOR SCHEDULE	E0.2	SCHEDULES - ELECTRICAL
		E2.1	FLOOR PLAN - LIGHTING
A3.0	REFLECTED CEILING PLAN	E3.1	FLOOR PLAN - POWER
A4.0	ENLARGED PLANS, INTERIOR ELEVATIONS & DETAILS	E5.1	SINGLE-LINE DIAGRAM ELECTRICAL
ID1.0	FINISH PLAN		

PROJECT DESCRIPTION

THE PROJECT CONSISTS OF TENANT IMPROVEMENTS TO SUPPORT YAMHILL COUNTY TRANSIT'S ADMINISTRATION, OPERATIONS, AND MAINTENANCE FUNCTIONS, WITHIN THEIR 9,600 SQUARE FOOT LEASE FACILITY BUILDING. THE WORK INCLUDES MINOR DEMOLITION OF EXISTING PARTITION WALLS, NEW WALLS AND DOORS, NEW CASEWORK AND SINK AT BREAKROOM, REMOVAL OF EXISTING TILE AND CARPET FLOORING, NEW INTERIOR FINISHES INCLUDING FLOORING AS INDICATED, PAINTING OF WALLS AND CEILINGS AS INDICATED, AND OTHER MISCELLANEOUS INTERIOR FINISHES.

IN ADDITION, REFER TO THE INVITATION TO BID AND SPECIFICATION SECTION 012300 - ALTERNATES FOR A DESCRIPTION OF THREE (3) ADDITIVE ALTERNATES.

PROJECT TEAM

PROPERTY OWNER
CH Holdings, LLC
7000 Amity Road
Amity, OR 97101

TENANT
Yamhill County Transit
11160 SW Durham Lane
McMinnville, Oregon 97128
Contact: Cynthia Thompson
(503) 474-4910

ARCHITECT
Waterleaf Architecture
1101 SW Washington Street
Portland, Oregon 97205
Contact: Jon Styner, Partner-in-Charge
Ellen Krusi, Project Architect
(503) 228-7571

VICINITY MAP



OPERATIONS CENTER - TENANT IMPROVEMENTS

11160 SW DURHAM LANE
MCMINNVILLE, OREGON 97128

ISSUED FOR BID
MAY 30, 2025

YAMHILL COUNTY TRANSIT

waterleaf
1101 SW Washington St
Portland OR 97205
Ph 503 228 7571
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architecture, interiors & planning

Exhibit B Board Order No.: 25-352

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

FIRE LIFE SAFETY CODE SUMMARY

APPLICABLE BUILDING CODES:	2022 OREGON STRUCTURAL SPECIALTY CODE AND 2022 OREGON FIRE CODE
ACCESSIBILITY:	THE DESIGN COMPLIES WITH THE FOLLOWING PROVISIONS:
(where conflicting the most conservative of these codes and standards shall apply)	CHAPTER 11 OF THE 2022 OREGON STRUCTURAL SPECIALTY CODE CHAPTER 10 OF THE 2017 INTERNATIONAL CODE COUNCIL/ANSI 117.1
JURISDICTION:	YAMHILL COUNTY
EXISTING TENANT OCCUPANCY:	B (BUSINESS) AND S-1
PROPOSED TENANT OCCUPANCY:	B (BUSINESS) AND S-1
AREA OF WORK (PROPOSED):	1,800 SF±

OCCUPANCY ANALYSIS

SECTION 1004 - OCCUPANT LOAD
(SEE OCCUPANT LOAD SCHEDULE)

PROPOSED: (B) = 39 OCC
(S-1) = 12 OCC

SECTION 1005 - MEANS OF EGRESS SIZING

EXIT WIDTH REQ. PER OSSC 1005 AND 1010: .15X123 = 18.45" (32" MIN. CLEAR REQ.)
EXIT WIDTHS EXISTING TO REMAIN: ALL DOORS ARE 36" WIDE

SECTION 1006 - NUMBER OF EXITS AND EXIT ACCESS DOORWAYS
TABLE 1006.2.1 - MAX COMMON PATH OF EGRESS TRAVEL

(B) MAX ALLOWABLE TRAVEL DISTANCE WITHOUT SPRINKLER: 75 FT
MAX COMMON PATH OF TRAVEL PROVIDED: 42'-0"
(S-1) MAX ALLOWABLE TRAVEL DISTANCE WITHOUT SPRINKLER: 100 FT
MAX COMMON PATH OF TRAVEL PROVIDED: 28'-0"

(B) EXITS REQUIRED: 1
EXITS PROVIDED (EXISTING): 2
(S-1) EXITS REQUIRED: 1
EXITS PROVIDED (EXISTING): 2

SECTION 1007 - EXIT AND EXIT ACCESS DOORWAY CONFIGURATION
SEPARATION OF EXITS SHALL NOT BE LESS THAN 1/2 OF MAX OVERALL DIAGONAL DIMENSION OF THE BUILDING

(B) SEPARATION OF 57'-10" (115'-6" / 2) REQ., PROVIDED = 60'-4", OK.
(S-1) SEPARATION OF 42'-1 1/2" (84'-3" / 2) REQ., PROVIDED = 47'-9", OK.

SECTION 1017 - EXIT ACCESS TRAVEL DISTANCE

(B) MAX ALLOWABLE TRAVEL DISTANCE WITHOUT SPRINKLER: 200 FT
MAX TRAVEL DISTANCE PROVIDED: 111 FT
(S-1) MAX ALLOWABLE TRAVEL DISTANCE WITHOUT SPRINKLER: 200 FT
MAX TRAVEL DISTANCE PROVIDED: 75 FT

PLUMBING FIXTURES
TABLE 2902.1 - MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES

PLUMBING FIXTURES REQUIRED: (B) 2 WC AND 1 LAV
(S-1) 1 WC AND 1 LAV

PLUMBING FIXTURES PROVIDED: (B) (2) EXISTING SINGLE-USER RESTROOMS WITH 1 WC AND 1 LAV EACH (2 WC AND 2 LAV TOTAL)
(S-1) (1) NEW SINGLE-USER RESTROOM WITH 1 WC AND 1 LAV

TYPES OF CONSTRUCTION - FIRE RESISTIVE REQUIREMENTS
TABLE 601 - FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

RATED CONSTRUCTION FOR - TYPE VB:
PRIMARY STRUCTURE, INTERIOR BEARING WALLS, FLOOR AND ROOF CONSTRUCTION AND ASSOCIATED: 0 HOUR
SECONDARY MEMBERS: 0 HOUR
EXTERIOR BEARING WALLS: 0 HOUR

RATED ENCLOSURES (SECTION 707): NOT APPLICABLE

SMOKE DETECTION AND FIRE ALARMS: EXISTING PER SECTION 907

ENERGY CODE OEESC 2021: LIGHTING SCOPE IS LESS THAN 10% OF THE EXISTING LIGHTING AND WILL NOT INCREASE THE OVERALL LIGHTING POWER DENSITY

GENERAL NOTES

1. THE CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS PRIOR TO PROCEEDING WITH ANY WORK. SHOULD ANY CONDITION ARISE WHERE THE INTENT OF THE DRAWINGS IS IN DOUBT OR WHERE THERE IS A DISCREPANCY BETWEEN THE DRAWINGS AND FIELD CONDITIONS, THE ARCHITECT SHALL BE NOTIFIED IMMEDIATELY TO PROVIDE CLARIFICATIONS.

2. ALL CONSTRUCTION SHALL COMPLY WITH THE 2022 OREGON STRUCTURAL SPECIALTY CODE AND LOCAL ORDINANCE. IN THE EVENT OF A CONFLICT WITH CODE REQUIREMENTS AND ITEMS CALLED OUT ON THE PLANS, THAT CODE OR CALL-OUT WHICH ESTABLISHES THE HIGHER STANDARD SHALL TAKE PRECEDENCE.

3. PROVIDE NECESSARY PRECAUTIONARY MEASURES TO PROTECT THE PUBLIC AND ADJACENT PROPERTIES FROM DAMAGE THROUGHOUT CONSTRUCTION.

4. DETAILS NOTED AS 'TYPICAL' OR 'TYP.' APPLY IN ALL CASES WHETHER OR NOT SPECIFICALLY REFERENCED. HOWEVER DETAILS THAT ARE SPECIFICALLY REFERENCED SHALL TAKE PRECEDENCE OVER TYPICAL DETAILS. SPECIFIC DETAILS AND NOTES SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND DETAILS.

5. DIMENSIONS TAKE PRECEDENCE OVER DRAWING. DO NOT SCALE DRAWING TO DETERMINE LOCATIONS. THE ARCHITECT SHALL BE NOTIFIED OF ANY DISCREPANCY PRIOR TO CONTINUING WITH WORK. DIMENSIONS ARE TAKEN TO THE FACE OF STUD (FOS), FACE OF FINISH (FOF), AND GRIDLINE, UNO.

FIRE LIFE SAFETY LEGEND

- EXISTING WALLS (FULL HEIGHT)
- EXISTING WALLS (PARTIAL HEIGHT)
- NEW WALLS / DOOR
- ILLUMINATED EXIT SIGN TO REMAIN UNO
- MAXIMUM EXIT TRAVEL DISTANCE
- EXISTING FIRE EXTINGUISHER TO REMAIN
- EXISTING FIRE EXTINGUISHER TO BE RELOCATED

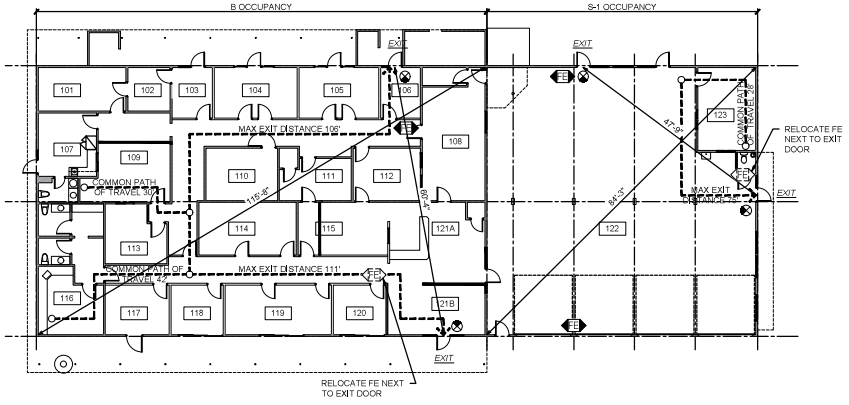
ROOM #	USE	OCCUPANCY TYPE	AREA	OCCUPANCY LOAD FACTOR	OCCUPANCY COUNT
101	STORAGE	S	190 SF	300/GSF	1
102	OFFICE	B	91 SF	150/GSF	1
103	OFFICE	B	101 SF	150/GSF	1
104	OFFICE	B	207 SF	150/GSF	2
105	OFFICE	B	199 SF	150/GSF	2
106	VESTIBULE	B	100 SF	150/GSF	1
107	BREAKROOM	B	182 SF	150/GSF	2
108	TRAINING ROOM	B	369 SF	150/GSF	3
109	CONFERENCE RM	B	232 SF	150/GSF	2
110	IT ROOM	B	186 SF	150/GSF	2
111	STORAGE	S	139 SF	300/GSF	1
112	OFFICE	B	175 SF	150/GSF	2
113	OFFICE	B	162 SF	150/GSF	2
114	OFFICE	B	253 SF	150/GSF	2
115	OFFICE	B	138 SF	150/GSF	1
116	BREAKROOM	B	192 SF	150/GSF	2
117	OFFICE	B	156 SF	150/GSF	2
118	OFFICE	B	128 SF	150/GSF	1
119	OFFICE	B	260 SF	150/GSF	2
120	OFFICE	B	130 SF	150/GSF	1
121A	DISPATCH	B	463 SF	150/GSF	4
121B	LOBBY	B	238 SF	150/GSF	2
122	SHOP	S-1	3276 SF	300/GSF	11
123	STORAGE	S	238 SF	300/GSF	1
TOTAL:			7805 SF		51

B OCCUPANCY

S-1 OCCUPANCY

OCCUPANT SUMMARY TABLE:

PROPOSED OCCUPANCY	
BUSINESS	6,000 SF @150 = 40 OCC
S-1	3,800 SF @300 = 12 OCC
TOTAL	52 OCC



1 FIRE LIFE SAFETY PLAN
G1.0 SCALE: 3/32" = 1'-0"

N

architecture, interior & planning
waterleaf
101 SW Washington St
Portland, OR 97204
ph 503 228 7551
fx 503 273 8951

YAMHILL COUNTY TRANSIT
OPERATIONS CENTER -
TENANT IMPROVEMENTS

11160 SW Durham Lane
McMinnville, Oregon 97128

REGISTERED ARCHITECT
JON C. STYNER
PORTLAND, OREGON
STATE OF OREGON

Project #: 2307.00
File #:
Date:
Revisions: May 30, 2025

ISSUED FOR BID

GENERAL NOTES,
FIRE LIFE SAFETY
CODE SUMMARY

G1.0

Exhibit B Board Order No.: 25-352

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

DEMOLITION FLOOR PLAN NOTES

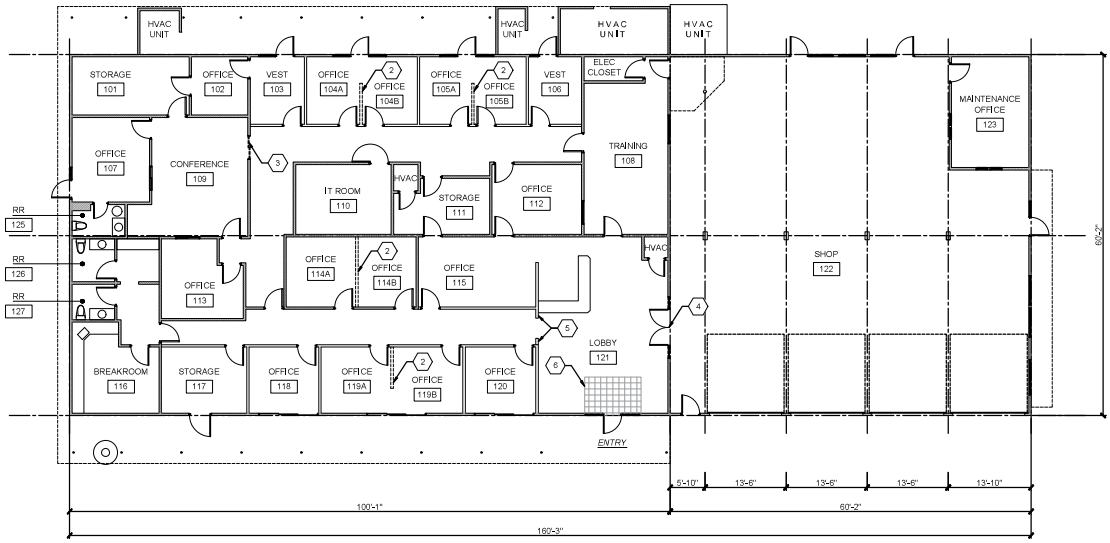
1. CONTRACTOR TO VERIFY EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCEMENT OF WORK.
2. PROTECT EXISTING FINISHES, FIXTURES AND ALARM SYSTEMS TO REMAIN.
3. PROTECT EXISTING UTILITIES AND MECHANICAL SYSTEMS.

KEY NOTES

1. NOT USED
2. DEMO WALL
3. REMOVE EXISTING RELITE AND WALL BELOW
4. REMOVE EXISTING DOOR/RELITE
5. DEMO CASED OPENING
6. DEMO EXISTING TILE FLOORING

LEGEND

- EXISTING WALLS (FULL HEIGHT)
- EXISTING WALLS (PARTIAL HEIGHT)
- EXISTING WALLS / DOORS TO BE REMOVED - SALVAGE TO OWNER



1 A2.0 DEMOLITION FLOOR PLAN
SCALE: 1/8" = 1'-0"

0' 8' 16'
SC: 1/8" = 1'-0"

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1001 SW Washington #210
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ph 503 228 7830
fx 503 273 8881

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DEMOLITION FLOOR PLAN

A2.0

Exhibit B Board Order No.: 25-352

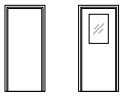
Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

DOOR AND FRAME SCHEDULE

DOOR INFORMATION		DOOR			FRAME		HDW GROUP
DOOR #	DIMENSIONS	TYPE	MAT	FIN	MAT	FIN	
04	3'-0"X 7'-0"	A	HM	PT	HM	PT	01
05	3'-0"X 7'-0"	B	HM	PT	HM	PT	02

NOTES:
1. KEYED FROM INSIDE AND OUTSIDE.
2. MATCH EXISTING DOOR HARDWARE AND COORDINATE KEYING WITH OWNER.

DOOR TYPES



KEY NOTES

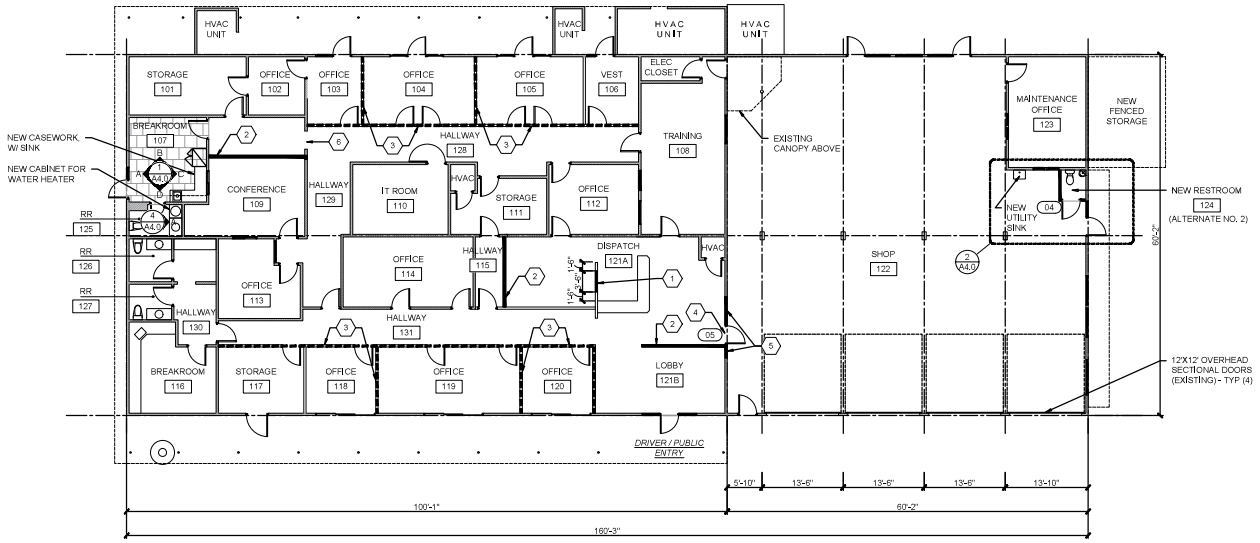
1. NEW CASED WINDOW OPENING - 3'-6" x 3'-6"
2. NEW FULL HEIGHT WALL - 2x4 WOOD STUDS @ 16" O.C. WITH 5/8" GYP. BD. BOTH SIDES
3. EXTEND EXISTING PARTIAL HEIGHT WALLS TO CEILING - SEE DETAIL 5/A4.0 (ALTERNATE NO. 1)
4. NEW DOOR/RELITE (SEE DOOR SCHEDULE)
5. INFILL EXISTING DOOR/RELITE OPENING
6. REPLACE RELITE WITH NEW CASED OPENING

LEGEND

- EXISTING WALLS (FULL HEIGHT)
- NEW WALLS / DOOR
- EXISTING WALLS (PARTIAL HEIGHT)
- EXTEND EXISTING PARTIAL HEIGHT WALL TO CEILING (ALTERNATE NO. 1)

FLOOR PLAN NOTES

1. CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO COMMENCEMENT OF WORK.
2. ALL ITEMS EXISTING EXCEPT OTHERWISE NOTED.



A2.1 FLOOR PLAN
SCALE: 1/8" = 1'-0"

SC: 1/8" = 1'-0"

BUILDING AREA:
9,642 SF

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1001 SW Washington St
Portland, OR 97205
ph 503 228 3933
fx 503 273 8891

YAMHILL COUNTY TRANSIT
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REGISTERED ARCHITECT
JON C. STYNER
PORTLAND, OREGON
STATE OF OREGON

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FLOOR PLAN AND DOOR SCHEDULE

A2.1

Exhibit B Board Order No.: 25-352

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REFLECTED CEILING PLAN NOTES

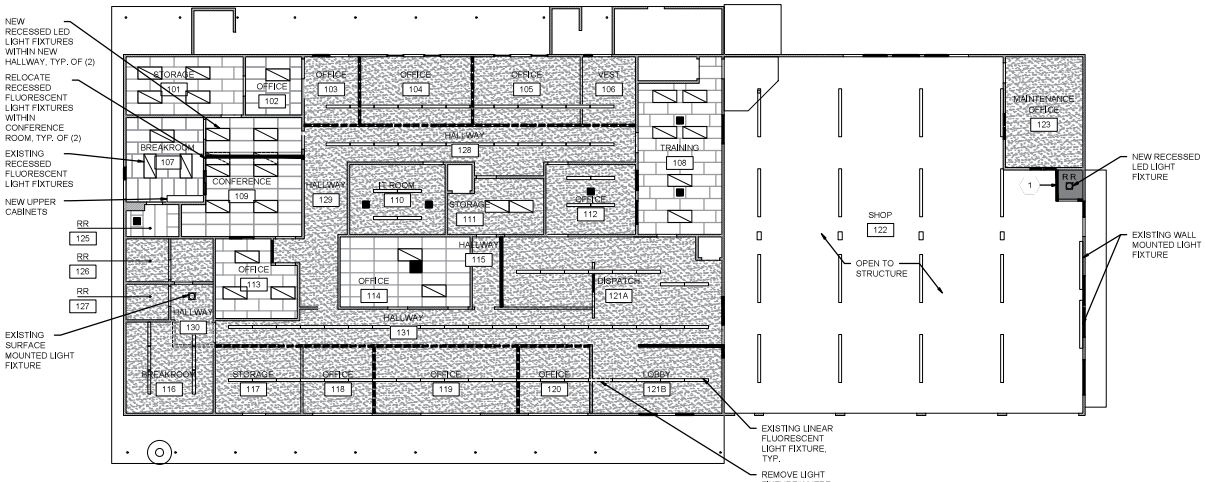
1. CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO COMMENCEMENT OF WORK.
2. ALL ITEMS EXISTING EXCEPT OTHERWISE NOTED.
3. NOT ALL EXISTING LIGHT FIXTURES ARE SHOWN.

KEY NOTES

1. NEW GYP. BD. CEILING - MATCH FRAMING SYSTEM AND CEILING HEIGHT OF ADJACENT MAINT. OFFICE 123

LEGEND

- EXISTING 2X4 SUSPENDED CEILING
- EXISTING GYP BOARD CEILING
- NEW GYP BOARD CEILING
- EXISTING RECESSED FLUORESCENT LIGHT FIXTURE
- EXISTING LINEAR SURFACE MOUNTED FLUORESCENT LIGHT FIXTURE
- EXTEND EXISTING PARTIAL HEIGHT WALL TO CEILING
- EXISTING MECHANICAL GRILLE
- EXISTING SURFACE MOUNTED LIGHT FIXTURE



1 A3.0 REFLECTED CEILING PLAN
SCALE: 1/8" = 1'-0"

0' 8' 16'
SC: 1/8" = 1'-0"

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McMinnville, Oregon 97128

REGISTERED ARCHITECT
JON C. STYNER
PORTLAND, OREGON
STATE OF OREGON

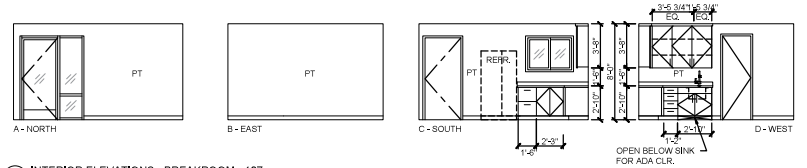
Project #: 2307.00
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Date:
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REFLECTED CEILING PLAN

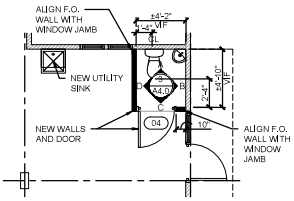
A3.0

Exhibit B Board Order No.: 25-352

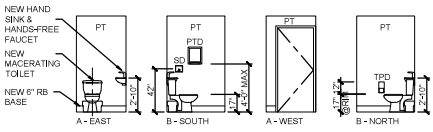
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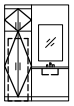
1 A4.0 INTERIOR ELEVATIONS - BREAKROOM - 107



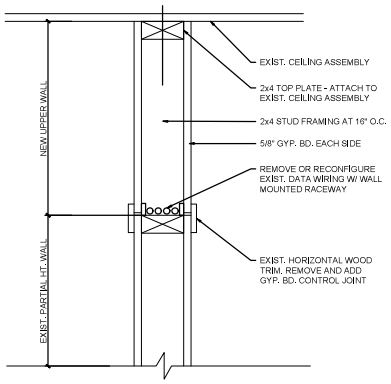
2 A4.0 ENLARGED PLAN - NEW RESTROOM - 124
(ALTERNATE NO. 2)



3 A4.0 INTERIOR ELEVATIONS - NEW RESTROOM - 124



4 A4.0 INTERIOR ELEVATION - RR 125



5 A4.0 EXIST. PARTIAL HT. WALL EXTENSION

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1331 NW Lovejoy St
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p 503.228.7335
fx 503.273.8897

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TENANT IMPROVEMENTS

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McMinnville, Oregon 97128

REGISTERED ARCHITECT
JON C. STYNER
PORTLAND, OREGON
STATE OF OREGON

Project #: 2307.00
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ENLARGED PLANS INT. ELEVATIONS & DETAILS

A4.0

Exhibit B Board Order No.: 25-352

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ROOM FINISH SCHEDULE

RM. #	ROOM NAME	FLOOR	WALL FINISH				BASE	CEILING	COMMENTS
			NORTH	EAST	SOUTH	WEST			
101	STORAGE	EXISTING TO REMAIN	-	-	-	-	-	-	
102	OFFICE	EXISTING TO REMAIN	-	-	-	-	-	-	
103	OFFICE	WM-1	P-1	P-1	P-1	P-1	RB	P-1	
104	OFFICE	CPT-1	P-1	P-1	P-1	P-1	RB	P-1	
105	OFFICE	CPT-1	P-1	P-1	P-1	P-1	RB	P-1	
106	VESTIBULE	WM-1	P-1	P-1	P-1	P-1	RB	P-1	
107	BREAKROOM	LIN-1	P-1	P-1	P-1	P-1	RB	-	
108	TRAINING	CPT-1	P-1	P-1	P-3	P-1	RB	-	
109	CONFERENCE	CPT-1	P-1	P-3	P-1	P-1	RB	-	
110	IT ROOM	EXISTING TO REMAIN	-	-	-	-	-	-	
111	STORAGE	EXISTING TO REMAIN	-	-	-	-	-	-	
112	OFFICE	CPT-1	P-1	P-1	P-1	P-1	RB	P-1	
113	OFFICE	CPT-1	P-1	P-1	P-1	P-1	RB	-	
114	OFFICE	CPT-1	P-1	P-1	P-1	P-1	RB	-	
115	HALLWAY	CPT-1	P-1	P-1	P-1	P-1	RB	P-1	
116	BREAKROOM	EXISTING TO REMAIN	-	-	-	-	-	-	
117	STORAGE	WM-1	P-1	P-1	P-1	P-1	RB	P-1	
118	OFFICE	CPT-1	P-1	P-1	P-1	P-1	RB	P-1	
119	OFFICE	CPT-1	P-1	P-1	P-1	P-1	RB	P-1	
120	OFFICE	CPT-1	P-1	P-1	P-1	P-1	RB	P-1	
121A	DISPATCH	WM-1	P-1	P-2	P-1	P-1	RB	P-1	
121B	LOBBY	WM-1	P-1	P-1	P-1	P-1	RB	P-1	PAINT P-1 ARTIST TO DO MURAL
122	SHOP	EXISTING TO REMAIN	-	-	-	-	-	-	
123	MAINTENANCE OFFICE	EXISTING TO REMAIN	-	-	-	-	-	-	
124	NEW RESTROOM	CONC.	P-1	P-2	P-1	P-1	RB	P-1	EPOXY PAINT
125	RR	EXISTING TO REMAIN	-	-	-	-	-	-	
126	RR	EXISTING TO REMAIN	-	-	-	-	-	-	
127	RR	EXISTING TO REMAIN	-	-	-	-	-	-	
128	HALLWAY	CPT-1	P-1	P-1	P-1	P-1/M-1	RB	P-1	PAINT P-1 ARTIST TO DO MURAL
129	HALLWAY	CPT-1	P-1	P-1	P-1/M-1	P-1	RB	P-1	PAINT P-1 ARTIST TO DO MURAL
130	HALLWAY	CPT-1	P-1	P-1	P-2	P-1	RB	P-1	
131	HALLWAY	CPT-1	P-1	P-1/M-1	P-1	P-1	RB	P-1	PAINT P-1 ARTIST TO DO MURAL

PAINTS AND COATINGS

P-1 MFR: SHERWIN WILLIAMS
COLOR: SHOJI WHITE - SW 7042
FINISH: WALLS - EGGSHELL
CEILINGS - EGGSHELL
TRIM & DOORS - SATIN

P-2 MFR: SHERWIN WILLIAMS
COLOR: REFUGE - SW 6228
FINISH: WALLS - EGGSHELL

P-3 MFR: SHERWIN WILLIAMS
COLOR: DILL SW 6438
FINISH: WALLS - EGGSHELL

M-1 CUSTOM MURAL BY OWNER

GENERAL PAINTING NOTES:
1. DO NOT PAINT WOOD TRIM OR DOORS
2. PAINT ALL EXISTING DRYWALL CEILINGS P-1. DO NOT PAINT EXISTING ACT.

FLOORING

LIN-1 MFR: FORBO FLOORING SYSTEMS
STYLE: FRESCO 3246
COLOR: SHRIKE 324635
THICKNESS: 2.5mm
SIZE: 33m X 200 cm

CPT-1 MFR: J + J FLOORING
STYLE: INTRINSIC MODULAR 7069
COLOR: 2726 INHERENT
SIZE: 24x24 INSTALL MONOLITHIC

WM-1 MFR: J + J FLOORING
STYLE: INCOGNITO MODULAR 7069
COLOR:1837 OPERATIVE
SIZE: 24x24 INSTALL MONOLITHIC

CONC SEALED CONCRETE

RB-1 MFR: ROPPE
STYLE: 4" PINNACLE
COLOR: 140 FAWN
SIZE: 4" 1/8"

WALL TACK PANELS

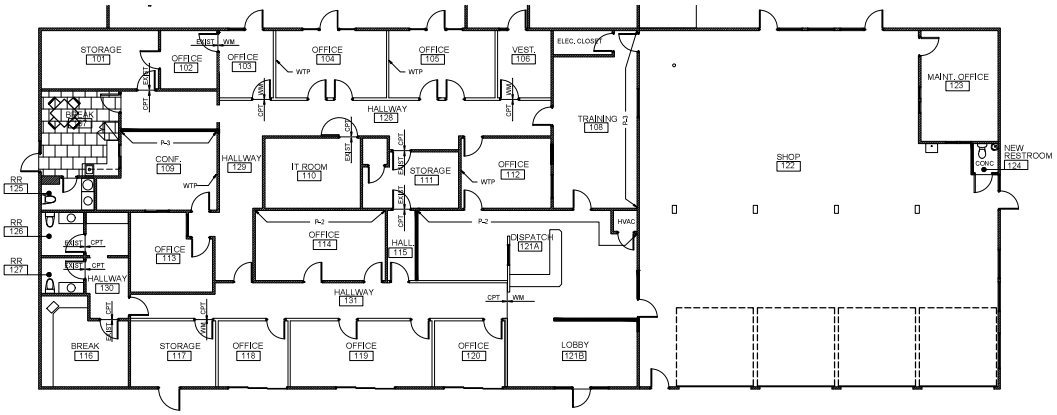
AT-1 ITEM: FELT RIGHT TILE
STYLE: VARIES
COLOR: SAGE
SIZE: SEE DRAWINGS FOR MORE INFO

AT-2 ITEM: FELT RIGHT TILE
STYLE: VARIES
COLOR: LATTE
SIZE: SEE DRAWINGS FOR MORE INFO

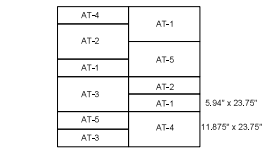
AT-3 ITEM: FELT RIGHT TILE
STYLE: VARIES
COLOR: PALM
SIZE: SEE DRAWINGS FOR MORE INFO

AT-4 ITEM: FELT RIGHT TILE
STYLE: VARIES
COLOR: ALOE
SIZE: SEE DRAWINGS FOR MORE INFO

AT-5 ITEM: FELT RIGHT TILE
STYLE: VARIES
COLOR: SLATE BLUE
SIZE: SEE DRAWINGS FOR MORE INFO



1 ID1.0 FINISH PLAN
1/16" = 1'-0"



2 ID1.0 WALL TACK PANEL (WTP)
NTS

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waterleaf
101 SW Washington St
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Portland, OR 97204
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f. 503.273.8891

YAMHILL COUNTY TRANSIT
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TENANT IMPROVEMENTS

11160 SW Durham Lane
McMinnville, Oregon 97128

TELLO INTERIORS

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Revisions: May 30, 2025
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FINISH PLAN
ID1.0

Exhibit B Board Order No.: 25-352

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MECHANICAL SYMBOL LIST

Diffusers and Grilles

- EXHAUST AIR
- RETURN AIR
- SUPPLY AIR

Ductwork Fittings

- RECTANGULAR DUCT DROP
- RECTANGULAR DUCT RISER

GENERAL SHEET NOTES

A. DESIGN BUILD WORK APPLIES TO DIVISION 23

B. DRAWINGS ARE PROVIDING DUCT DROPS AND GRILL LOCATIONS - CONTRACTOR TO PROVIDE CODE COMPLIANT AIR REQUIREMENTS AND PROVIDE ACTUAL DB PLANS.

C. SITE VERIFY PRIOR TO ANY WORK BEING DONE.

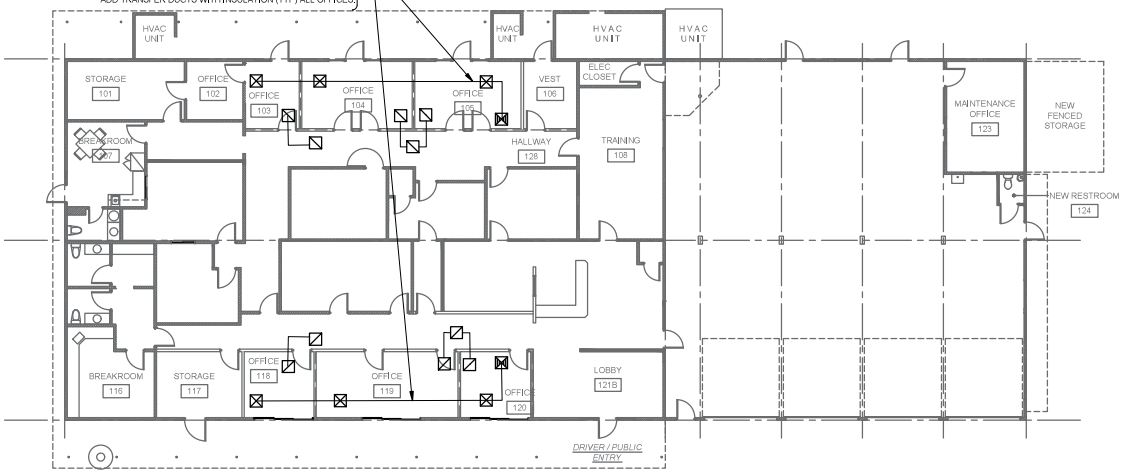
D. SUPPLY AND TRANSFER GRILLES ARE TO MATCH OWNERS RECOMMENDATIONS.

E. TRANSFER DUCTS TO BE LINED FOR OFFICE PRIVACY

SITE VERIFY MECHANICAL SUPPLY DUCT DROP LOCATION PRIOR TO ANY DEMO.

ADD DIFFUSERS FOR SUPPLY AIR CONNECTIONS (TYP) ALL OFFICES - PROVIDE LOAD CALCULATIONS AND VENTILATION FOR OFFICE TO MEET CODE.

ADD TRANSFER DUCTS WITH INSULATION (TYP) ALL OFFICES.



1 FLOOR PLAN - MECHANICAL - ALTERNATE # 1

SCALE: 1/8"=1'-0"

FILE: M2.1 FLOOR PLAN – MECHANICAL.DWG – LAYOUT1 | EDIT: 5/22/2025 11:23 AM BY RAYMONDC | PLOT: 5/22/2025 11:26 AM BY RAYMOND CAMPOS

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EXPIRES: 12/31/25

Project #: 2307.00
File #:
Date:
Revisions: MAY 30, 2025

ISSUED FOR BID

FLOOR PLAN - MECHANICAL

M2.1

Exhibit B Board Order No.: 25-352

Docusign Envelope ID: 4407214E-387C-4155-A00E-A8DF4F5F21EB

PLUMBING SYMBOL LIST

Abbreviations

(E)	EXISTING
(N)	NEW
AFF	ABOVE FINISHED FLOOR
BFF	BELOW FINISHED FLOOR
BLDG	BUILDING
BTUH	BRITISH THERMAL UNITS PER HOUR
CD	CONDENSATE DRAIN
CFH	CUBIC FEET PER HOUR
CFS	CUBIC FEET PER SECOND
CO	CLEANOUT
CONT.	CONTINUATION
CW	COLD WATER
D	DRAIN
DFU	DRAINAGE FIXTURE UNIT
DN	DOWN
DWV	DRAINAGE, WASTE AND VENT
EWH	ELECTRIC WATER HEATER
F	FIRE, FAHRENHEIT
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FT	FEET
GPM	GALLONS PER MINUTE
HB	HOSE BIBB
HVAC	HEATING, VENTILATING AND AIR CONDITIONING
HW	HOT WATER
HWFU	HOT WATER FIXTURE UNIT
HWR	HOT WATER RETURN
INV.	INVERT ELEVATION
L	LAVATORY
MIN	MINIMUM
MS	MOP SINK
N	NORTH
NO.	NUMBER
NTS	NOT TO SCALE
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
PLBG	PLUMBING
POC	POINT OF CONNECTION
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
QTY	QUANTITY
S, SK	SINK
SAN	SANITARY
SF	SQUARE FEET
SHT	SHEET
SOV	SHUT OFF VALVE
TEMP	TEMPERATURE
TYP	TYPICAL
V	VACUUM, VENT, VOLT
VTR	VENT THRU ROOF
W/	WITH
W	WASTE
WC	WATER COLUMN, WATER CLOSET
WCO	WALL CLEANOUT
WH	WATER HEATER, WALL HYDRANT
WSFU	WATER SUPPLY FIXTURE UNIT

General

- EXISTING WORK
- NEW WORK
- CONTINUATION
- POINT OF CONNECTION
- XXX-X — HVAC EQUIPMENT IDENTIFICATION (REF. ONLY)
- XX-X / LOCATION — PLUMBING EQUIPMENT IDENTIFICATION
- X — KEYED NOTE

Piping Fittings

- PIPE DROP
- PIPE RISE
- TEE DOWN ON PIPE
- TEE UP ON PIPE
- WCO — WALL CLEANOUT

Piping Systems

- COLD WATER PIPING
- HOT WATER PIPING
- SANITARY VENT PIPING
- SANITARY WASTE OR SOIL PIPING BELOW GRADE OR FINISHED FLOOR

Valves

- SHUTOFF VALVE, GENERAL

SHEET INDEX

P0.1	SYMBOLS LIST - PLUMBING
P2.1	FLOOR PLAN - PLUMBING

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Revisions: MAY 30, 2025

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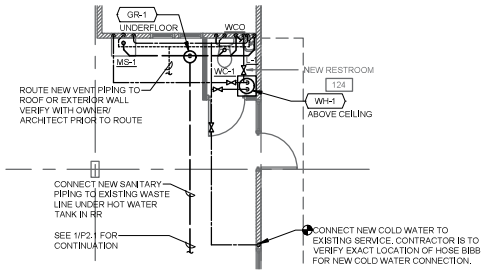
SYMBOLS LIST
- PLUMBING

P0.1

FILE: P0.1 SYMBOLS LIST – PLUMBING.DWG – LAYOUT1 | EDIT: 5/22/2025 11:23 AM BY RAYMONDC | PLOT: 5/22/2025 11:26 AM BY RAYMOND CAMPOS

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2 ENLARGED NEW RESTROOM 124 - PLUMBING - ALTERNATE # 2

SCALE: 1/4"=1'-0"

GENERAL SHEET NOTES

A. DESIGN BUILD WORK APPLIES TO DIVISION 22.

B. DRAWINGS ARE PROVIDING MAJOR EQUIPMENT LOCATIONS.

C. FINAL SELECTIONS OF PLUMBING FIXTURES IN RESTROOM AND BREAK ROOM MADE IN COLLABORATION WITH OWNER, ARCHITECT AND CONTRACTOR.

D. WH-1 - LOW BOY ELECTRIC WATER HEATER

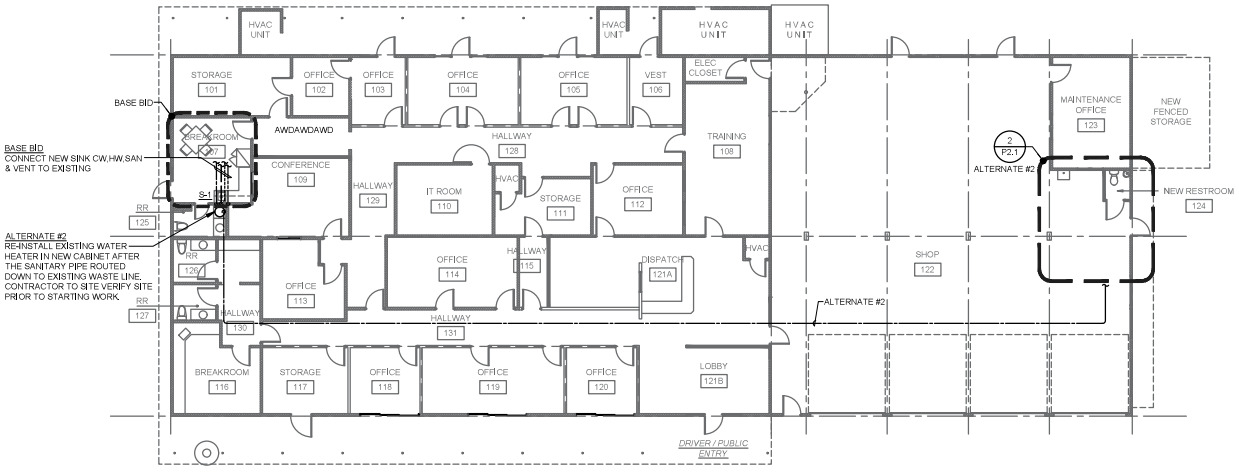
E. WC-1 - FLOOR MOUNTED VITREOUS CHINA WITH 1.28 GALLONS PER FLUSH, AUTOMATIC.

F. MS-1 - STAINLESS STEEL WASH TUB WITH STANDARD FAUCET FIXTURE.

G. L-1 - VITREOUS CHINA WALL HUNG WITH STANDARD LOW FLOW FAUCET.

H. S-1 - STAINLESS STEEL UNDER MOUNT SINK, STANDARD KITCHEN FAUCET.

I. GR-1 GRINDER PUMP WITH BASIN.



1 FLOOR PLAN - PLUMBING

SCALE: 1/8"=1'-0"

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Project #: 2307.00
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FLOOR PLAN - PLUMBING

P2.1

FILE: P2.1 FLOOR PLAN – PLUMBING.DWG – LAYOUT1 | EDIT: 5/22/2025 11:24 AM BY RAYMONDC | PLOT: 5/22/2025 11:26 AM BY RAYMOND CAMPOS

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ELECTRICAL SYMBOL LIST

NOTE: This is a standard symbol list and not all items listed may be used.

Abbreviations

(E)	EXISTING
(N)	NEW
(R)	RELOCATE
(X)	DEMOLISH
A	AMPERES, AMBER
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
AHJ	AUTHORITY HAVING JURISDICTION
AIC	AVAILABLE INTERRUPTING CAPACITY
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AWG	AMERICAN WIRE GAUGE
C	CONDUIT, CLOSE, CONTROL
CA	CABLE
CLG	CEILING
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFI	GROUND FAULT INTERRUPTER
GFP	GROUND FAULT PROTECTION
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NESC	NATIONAL ELECTRIC SAFETY CODE
TYP	TYPICAL
UL	UNDERWRITERS LABORATORIES

Connections / Equipment

- CEILING MOUNTED JUNCTION BOX
- MOTOR CONNECTION
- NON-FUSED DISCONNECT SWITCH

General

- DEMOLISH
- DETAIL NUMBER AND SHEET LOCATION
- EQUIPMENT IDENTIFICATION
- EXISTING WORK
- KEYED NOTE
- NEW WORK

Lighting

- EXIT SIGN CEILING MOUNTED, ARROW(S) INDICATES DIRECTION IF SHOWN
- EXIT SIGN WALL MOUNTED, ARROW(S) INDICATES DIRECTION IF SHOWN
- RECESSED 1' X 4' LUMINAIRE
- RECESSED 1' X 4' LUMINAIRE CONNECTED TO EMERGENCY/LIFE SAFETY CIRCUIT OR WITH INTEGRAL EMERGENCY BATTERY CONNECTED TO UNSWITCHED CIRCUIT
- RECESSED 2' X 2' LUMINAIRE
- RECESSED 2' X 2' LUMINAIRE CONNECTED TO EMERGENCY/LIFE SAFETY CIRCUIT OR WITH INTEGRAL EMERGENCY BATTERY CONNECTED TO UNSWITCHED CIRCUIT
- RECESSED 2' X 4' LUMINAIRE
- RECESSED 2' X 4' LUMINAIRE CONNECTED TO EMERGENCY/LIFE SAFETY CIRCUIT OR WITH INTEGRAL EMERGENCY BATTERY CONNECTED TO UNSWITCHED CIRCUIT
- RECESSED LUMINAIRE
- RECESSED LUMINAIRE CONNECTED TO EMERGENCY/LIFE SAFETY CIRCUIT
- SURFACE MOUNTED 2' X 2' LUMINAIRE CONNECTED TO EMERGENCY/LIFE SAFETY CIRCUIT OR WITH INTEGRAL EMERGENCY BATTERY CONNECTED TO UNSWITCHED CIRCUIT
- SURFACE MOUNTED 2' X 4' LUMINAIRE
- SURFACE MOUNTED 2' X 4' LUMINAIRE CONNECTED TO EMERGENCY/LIFE SAFETY CIRCUIT OR WITH INTEGRAL EMERGENCY BATTERY CONNECTED TO UNSWITCHED CIRCUIT
- SURFACE OR PENDANT MOUNTED 1' X 4' LUMINAIRE
- SURFACE OR PENDANT MOUNTED 1' X 4' LUMINAIRE CONNECTED TO EMERGENCY/LIFE SAFETY CIRCUIT OR WITH INTEGRAL EMERGENCY BATTERY CONNECTED TO UNSWITCHED CIRCUIT
- SURFACE OR PENDANT MOUNTED LUMINAIRE CONNECTED TO EMERGENCY/LIFE SAFETY CIRCUIT OR WITH INTEGRAL EMERGENCY BATTERY CONNECTED TO UNSWITCHED CIRCUIT
- SURFACE OR PENDANT MOUNTED STRIPLIGHT

Miscellaneous

- #10 AWG/#6 #8-27,29,31. BRANCH CIRCUIT WIRING. ARROW INDICATES HOME RUN TO PANEL WITH CIRCUITS AS NOTED. WIRE SIZE IS #12 AWG MINIMUM UNLESS NOTED OTHERWISE. SHORT TICK MARKS INDICATE PHASE CONDUCTORS. LONG TICK MARKS INDICATE NEUTRAL CONDUCTORS. A SINGLE CURVED TICK MARK INDICATES INSULATED GREEN GROUND CONDUCTOR. SECOND CURVED TICK MARK INDICATES "ISOLATED GROUND" (GREEN INSULATION WITH YELLOW STRIPE) CONDUCTOR.
- BRANCH PANEL
- CIRCUIT BREAKER
- FLUSH WALL MOUNTED BRANCH PANEL

Raceways

- CONDUIT CONCEALED IN WALL OR CEILING SPACE
- CONDUIT ELLED DOWN
- CONDUIT ELLED UP
- CONDUIT ROUTED BELOW FLOOR / GRADE
- CONDUIT/WIRING CONTINUATION
- CONDUIT/WIRING STUBBED OUT WITH END CAP OR INSULATED PLASTIC BUSHING
- FLEXIBLE CONDUIT

Switches and Receptacles

- CEILING MOUNTED OCCUPANCY SENSOR
  - P = PASSIVE INFRARED
  - D = DUAL TECHNOLOGY
  - U = ULTRASONIC, 360 DEG RANGE
  - H = ULTRASONIC, HALLWAY PATTERN
  - v (LOWERCASE) = VACANCY CONTROL DESIGNATION
- DOUBLE DUPLEX RECEPTACLE. SEE LETTER CODE LIST AT DUPLEX RECEPTACLE FOR OPTIONS
- DUPLEX RECEPTACLE (MULTIPLE LETTERS INDICATE MULTIPLE OPTIONS)
  - A = ABOVE COUNTER
  - B = CLOCK HANGER
  - C = FLUSH CEILING MOUNTED
  - E = EMERGENCY
  - F = ARC FAULT PROTECTED BY BREAKER IN PANEL
  - G = GROUND FAULT CIRCUIT INTERRUPTER
  - H = HOSPITAL GRADE
  - K = CHILD RESISTANT COVER
  - L = ISOLATED GROUND
  - P = PENDANT MOUNTED WITH CORD GRIPS. VERIFY PENDANT LENGTH
  - R1 = HALF SWITCHED BY OCCUPANCY SENSOR RELAY
  - R2 = FULLY SWITCHED BY OCCUPANCY SENSOR RELAY
  - S = SPLIT WIRED
  - T = TAMPER RESISTANT SHUTTERED RECEPTACLE
  - U = USB PORT(S)
  - W = WEATHERPROOF CONTINUOUS USE COVER, GFCI PROTECTED, WITH WEATHER-RESISTANT RECEPTACLE
- EQUIPMENT ELECTRICAL CONNECTION
- PHOTO ELECTRIC SWITCH
  - D = CONTINUOUS DIMMING PHOTOCELL
  - S = SWITCHED PHOTOCELL
- $ SINGLE POLE SWITCH
  - 2 = DOUBLE POLE SWITCH
  - 3 = THREE-WAY SWITCH
  - 4 = FOUR-WAY SWITCH
  - a THRU z (LOWERCASE) = LUMINAIRE CONTROL DESIGNATION
  - D = DIMMER
  - F = FAN SPEED CONTROL
  - K = KEY OPERATED SWITCH
  - L = LIGHTED HANDLE
  - M = MANUAL SOTOR STARTER WITH THERMAL OVERLOAD
  - P = SWITCH WITH PILOT LIGHT
  - S = SENTRY SWITCH
  - T = INTERVAL TIMER
  - W = WEATHERPROOF SWITCH
  - V = LOW VOLTAGE SWITCH
- WALL MOUNTED OCCUPANCY SENSOR
  - P = PASSIVE INFRARED
  - D = DUAL TECHNOLOGY
  - v (LOWERCASE) = VACANCY CONTROL DESIGNATION
- WALL MOUNTED OCCUPANCY SENSOR/SWITCH
  - S = PASSIVE INFRARED WITH INTEGRAL "OFF" SWITCH
  - T = DUAL RELAY PASSIVE INFRARED WITH TWO INTEGRAL "OFF" SWITCHES
  - D = PASSIVE INFRARED WITH INTEGRAL DIMMER TO OFF.
  - v (LOWERCASE) = VACANCY CONTROL DESIGNATION

SHEET INDEX

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E2.1	FLOOR PLAN - LIGHTING
E3.1	FLOOR PLAN - POWER
E5.1	SINGLE-LINE DIAGRAMS - ELECTRICAL

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SYMBOLS LIST - ELECTRICAL

E0.1

FILE: E0.1 SYMBOLS LIST – ELECTRICAL.DWG – LAYOUT1 | EDIT: 5/22/2025 11:45 AM BY RAYMONDC | PLOT: 5/22/2025 11:46 AM BY RAYMOND CAMPOS

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Existing Panel 'A'

120/208V, 3 Ph., 4 W., 200A Bus with 200A Main Circuit Breaker Surface Mounted Panelboard with an Available Fault Current of 9956A RMS

201x-2xxx

Ckt. No.	Description / Location	Load (VA)[Type]	C.B. A/Pole	Note	Ph.	Note	C.B. A/Pole	Load (VA)[Type]	Description / Location	Ckt. No.
1	EXISTING NORTH WATER HEATER		20/2		A		60/2		EXISTING FURNACE	2
3	—		-		B		-		—	4
5	EXISTING SHOP FURNACE		40/2		C		60/2		EXISTING UNVERFIED LOAD	6
7	—		-		A		-		—	8
9	EXISTING AIR CONDITIONER		50/2		B		50/2		EXISTING LIFT	10
11	—		-		C		-		—	12
13	EXISTING OUTSIDE GFCI		40/2		A		20/1		EXISTING RECEPTACLES	14
15	—		-		B		30/2		EXISTING HEAT PUMP	16
17	NEW SUB PANEL D		100/3	1	C		-		—	18
19	—		-		A		20/1		EXISTING HEATER OFFICE	20
21	—		-		B		30/2		EXISTING WATER HEATER	22
23	EXISTING RECEPTACLES		20/1		C		-		—	24
25	EXISTING RECEPTACLES		20/1		A		100/2		EXISTING AIR COMPRESSOR	26
27	EXISTING RECEPTACLES		15/1		B		-		—	28
29	EXISTING RECEPTACLES		20/1		C		-		—	30

Total Connected Load:	Ph. A	0 VA	0 Amps	Panel Connected Load:	0.0 KVA	0.0 Amps		
Total Connected Load:	Ph. B	0 VA	0 Amps	Sub-Fed Connected Load:	0.0 KVA	0.0 Amps		
Total Connected Load:	Ph. C	0 VA	0 Amps	**Total Demand Load:**	0.0 **KVA**	0.0 **Amps**		

Notes:
1. NEW 100 AMP BREAKER FOR NEW PANEL D. RELOCATED EXISTING SHOP FURNACE CIRCUIT TO NEW PANEL D
2.
3.
4.
5.

Accessories:

New Panel 'D'

120/208V, 3 Ph., 4 W., 100A Bus with Main Lug Only Surface Mounted Panelboard with an Available Fault Current of 9956A RMS

201x-2xxx

Ckt. No.	Description / Location	Load (VA)[Type]	C.B. A/Pole	Note	Ph.	Note	C.B. A/Pole	Load (VA)[Type]	Description / Location	Ckt. No.
1	GR-1	1,000 M	25/2	1	A		20/1	1,200 R	R-BREAKROOM REF	2
3	—	1,000 M	-	1	B		20/1	180 R	R-BREAKROOM COUNTER	4
5	WH-1	2,250 H	30/2		C		20/1	180 R	R-BREAKROOM COUNTER	6
7	—	2,250 H	-		A		20/1	360 R	R-BREAKROOM	8
9	L-OFFICE	750 L	20/1	2	B		20/1		SPARE	10
11	L-OFFICE	750 L	20/1	2	C		20/1		SPARE	12
13	L-OFFICE	750 L	20/1	2	A		20/1		SPARE	14
15	SPARE		20/1		B		20/1		SPARE	16
17	SPARE		20/1		C		-		SPACE	18
19	SPARE		20/1		A	3	60/3		EXISTING SHOP FURNACE	20
21	SPARE		20/1		B		-		—	22
23	SPARE		20/1		C		-		—	24

Total Connected Load:	Ph. A	5,560 VA	46 Amps	Panel Connected Load:	10.7 KVA	29.6 Amps		
Total Connected Load:	Ph. B	1,930 VA	16 Amps	Sub-Fed Connected Load:	0.0 KVA	0.0 Amps		
Total Connected Load:	Ph. C	3,180 VA	26 Amps	**Total Demand Load:**	11.7 **KVA**	32.6 **Amps**		

Notes:
1. ALTERNATE NO. 2
2. ALTERNATE NO. 3
3. RELOCATED CIRCUIT FROM PANEL A
4.
5.

Accessories:

MECHANICAL EQUIPMENT CONNECTION SCHEDULE

ITEM	DESCRIPTION	LOCATION	VOLTS / PHASE	LOAD	MCA	MOCP	WIRE / CONDUIT	CIRCUIT	NOTES
GR-1	GRINDER	SHOP 122	208/1	2.0 hp		25	202	D-1,3,	
WH-1	WATER HEATER	NEW RESTROOM 124	208/1	4.5 kw		35	402	D-5,7,	

GENERAL MECHANICAL EQUIPMENT CONNECTION SCHEDULE NOTES

A. THE ABOVE INFORMATION IS FOR A SPECIFIC MANUFACTURER. ACTUAL MANUFACTURER FOR EQUIPMENT MAY BE DIFFERENT. COORDINATE WITH MECHANICAL EQUIPMENT SUBMITTALS FOR LOADS AND OVER CURRENT PROTECTION REQUIREMENTS PRIOR TO INSTALLATION OF WIRING.

B. MOCP = MAXIMUM OVER CURRENT PROTECTION
MCA = MINIMUM CIRCUIT AMPACITY

C. PROVIDE DISCONNECTING MEANS FOR EACH ITEM OF EQUIPMENT LISTED IN THE SCHEDULE ABOVE, EXCEPT AS SPECIFICALLY NOTED OTHERWISE IN SCHEDULE NOTES, BELOW.

MECHANICAL EQUIPMENT CONNECTION SCHEDULE NOTES

1 SEE ONE LINE POWER DIAGRAM FOR FEEDER SIZE.
2 INTERLOCK WITH HOOD EXHAUST.

WIRE / CONDUIT SCHEDULE

202 2 #12 CU, 1 #12 CU GND., IN 3/4" C.
402 2 #8 CU, 1 #10 CU GND., IN 3/4" C.

ALTERNATIVE # 2

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MARK E. OTLEANS
EXPIRES:12/31/26

Project #: 2307.00
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SCHEDULES - ELECTRICAL

E0.2

FILE: E0.2 SCHEDULES - ELECTRICAL.DWG - LAYOUT1 | EDIT: 5/14/2025 10:25 AM BY RAYMONDC | PLOT: 5/22/2025 11:46 AM BY RAYMOND CAMPOS

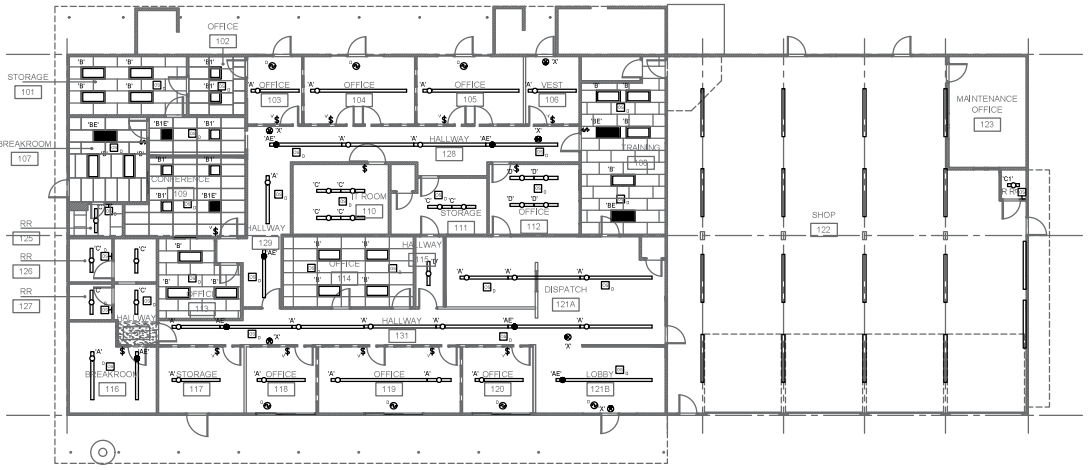
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LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	HOUSING	SHIELDING	MOUNTING	FINISH	ULIP RATING	DRIVER/ POWER SUPPLY	LIGHT SOURCE	INPUT WATTS	MFG/CATALOG #	NOTES
X	UNIVERSAL EXIT SIGN; CHEVRONS AS INDICATED ON ELECTRICAL DRAWINGS; SINGLE OR DUAL FACED AS INDICATED ON ELECTRICAL DRAWINGS; NOMINAL 12IN WIDE X 8.5IN TALL X 2.5IN DEEP; CONTRACTOR TO VERIFY BACK BOX REQUIREMENTS PRIOR TO ROUGH-IN	THERMOPLASTIC; DIE CAST ALUMINUM		UNIVERSALLY MOUNTED; REFER TO ARCHITECTURAL DETAILS FOR MOUNTING CONFIGURATION	BRUSHED ALUMINUM	UL DRY	INTEGRAL DRIVER	GREEN LETTERING LED | RED LETTERING LED	2 WATTS	EVENLITE SENTRY SERIES; ISOLITE; SURE-LITES; BARRON LIGHTING; OR APPROVED	
A	RECESSED LINEAR LED DIRECT/INDIRECT; NOMINAL 2.4IN WIDE BY 4.5IN TALL BY LENGTH AS SHOWN ON DRAWINGS	EXTRUDED ALUMINUM	FROSTED ACRYLIC LENS	SUSPENDED	WHITE	UL DRY	INTEGRAL DRIVER; 0-10V DIMMING TO 1%	500 NOMINAL LUMENS DIRECT AND 250 LUMENS INDIRECT; 2700K LED; 70CRI		FOCAL POINT SEEM 2 OR APPROVED EQUAL	
AE	SAME AS TYPE A EXCEPT WITH EMERGENCY BATTERY PACK										
B	RECESSED 2X4 LED TROFFER; NOMINAL 2FT WIDE BY 4FT LONG BY XIN TALL	COLD ROLLED STEEL	FROSTED ACRYLIC LENS	RECESSED	WHITE	UL DRY	INTEGRAL DRIVER; 0-10V DIMMING TO 1%	6000 NOMINAL LUMENS; 2700K LED; 70CRI	44	LEDALITE ARCFORM DUO OR APPROVED EQUAL	
BE	SAME AS TYPE B EXCEPT WITH EMERGENCY BATTERY PACK										
B1	RECESSED 2X2 LED TROFFER; NOMINAL 2FT WIDE BY 2FT LONG BY XIN TALL	COLD ROLLED STEEL	FROSTED ACRYLIC LENS	RECESSED	WHITE	UL DRY	INTEGRAL DRIVER; 0-10V DIMMING TO 1%	4500 NOMINAL LUMENS; 2700K LED; 70CRI	32	LEDALITE ARCHFORM DUO OR APPROVED EQUAL	
B1E	SAME AS TYPE B1 EXCEPT WITH EMERGENCY BATTERY PACK										

NOTES:
1. THIS LUMINAIRE SCHEDULE IS NOT COMPLETE WITHOUT A COPY OF THE PROJECT MANUAL CONTAINING THE ELECTRICAL SPECIFICATIONS.
2. DIMMING CONTROL PROTOCOL (0-10VDC, LINE VOLTAGE, DALI, ETC.) COMPATIBLE WITH LIGHTING CONTROL SYSTEM AS SPECIFIED AND SHOWN ON DRAWINGS.
3. PROVIDE +/- 12 INCH ADJUSTABILITY IN AIRCRAFT CABLE LENGTH WHERE USED.
4. COORDINATE ALL CEILING TYPES WITH LUMINAIRE LOCATIONS PRIOR TO ORDERING LUMINAIRES. COORDINATE INSTALLATION WITH REFLECTED CEILING PLAN.
5. SPECIFIED MANUFACTURERS ARE APPROVED TO SUBMIT BID. INCLUSION DOES NOT RELIEVE MANUFACTURER FROM SUPPLYING PRODUCT AS DESCRIBED.
6. PROVIDE SUBMITTALS THAT INCLUDE THE LUMINAIRE, LAMP AND DIMMABLE LED DRIVER INFORMATION OF EACH LUMINAIRE, WITH APPLICABLE OPTIONS CLEARLY CHECKED OR HIGHLIGHTED. SUBMITTALS NOT INCLUDING THIS INFORMATION WILL BE RETURNED AS REJECTED BY THE ENGINEER OF RECORD.



1 FLOOR PLAN - LIGHTING - ALTERNATE # 3

SCALE: 1/8"=1'-0"

FILE: E2.1 FLOOR PLAN – LIGHTING.DWG – LAYOUT1 | EDIT: 5/15/2025 3:41 PM BY RAYMONDC | PLOT: 5/22/2025 11:46 AM BY RAYMOND CAMPOS

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REGISTERED PROFESSIONAL ENGINEER
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OREGON
RENEWS: 12/31/2026
MARK E. O'LEARY
EXPIRES:12/31/26

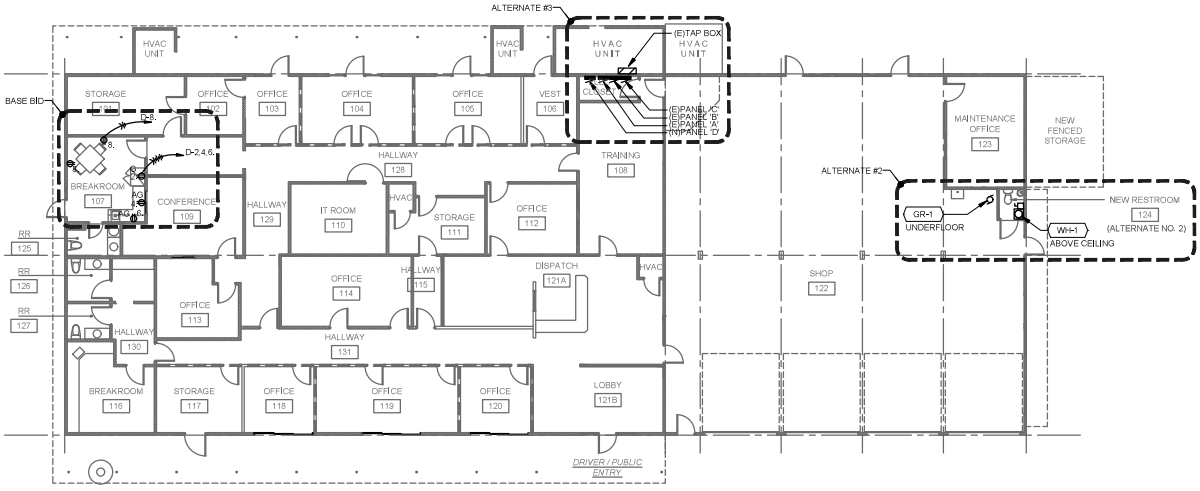
Project #: 2307.00
File #:
Date:
Revisions: MAY 30, 2025
ISSUED FOR BID

FLOOR PLAN - LIGHTING

E2.1

Exhibit B Board Order No.: 25-352

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1 FLOOR PLAN - POWER

SCALE: 1/8"=1'-0"

FILE: E3.1 FLOOR PLAN – POWER.DWG – LAYOUT1 | EDIT: 5/21/2025 3:25 PM BY RAYMONDC | PLOT: 5/22/2025 11:46 AM BY RAYMOND CAMPOS

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Project #: 2307.00
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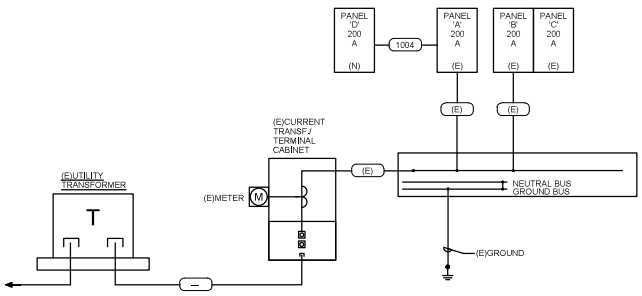
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FLOOR PLAN - POWER

E3.1

Exhibit B Board Order No.: 25-352

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GENERAL DETAIL NOTES

A. CALCULATED VALUES FOR AVAILABLE FAULT CURRENT ARE SUITABLE FOR PLAN REVIEW PURPOSES BUT ARE NOT CONSIDERED ACCURATE FOR ACTUAL INSTALLED FEEDER ROUTING. UPDATE THE AS-BUILT DRAWING SET AT THE CONSTRUCTION SITE WITH RESULTS OF CALCULATIONS FOR FAULT CURRENT BASED ON ACTUAL FEEDER LENGTHS AND ROUTING USING RESULTS OF LICENSED SOFTWARE PER APPROVED ELECTRICAL DISTRIBUTION SYSTEM STUDY (SECTION 26 05 73).

LINE TYPE LEGEND

- NEW
- EXISTING TO REMAIN
- EXISTING TO BE REMOVED

FEEDER SCHEDULE

Key

A, C, S, X	A = Aluminum C = Conduit only S = Service secondary X = Separately derived system
1004	4 #2 CU, 1 #8 CU GND., IN 1-1/4" C.

1 EXISTING ONE-LINE POWER DISTRIBUTION DIAGRAM

NO SCALE

EPO1L06A - ONE-LINE POWER DISTRIBUTION DIAGRAM

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SINGLE-LINE DIAGRAM
ELECTRICAL

E5.1

FILE: E5.1 SINGLE-LINE DIAGRAMS - ELECTRICAL.DWG - LAYOUT1 | EDIT: 5/14/2025 10:26 AM BY RAYMONDC | PLOT: 5/22/2025 11:47 AM BY RAYMOND CAMPOS

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