Contract Review Sheet

Public Improvement Agreements **BS-6251-24**

Title: **Jail Court Annex HVAC Renovation Project**

Contractor's Name: **Hermanson Company**

Department: **Business Services Department** Contact: **Vanessa Keck**

Analyst: **Kathleen George** Phone #: **(503) 566-3910**

Term - Date From: **Execution** Expires: **November 30, 2025**

Original Contract Amount: **$ 755,061.00** Previous Amendments Amount: **$ -**

Current Amendment: **$ -** New Contract Total: **$ 755,061.00** Amd% **0%**

☐ Outgoing Funds ☐ Federal Funds ☐ Reinstatement ☐ Retroactive ☐ Amendment greater than 25%

Source Selection Method: **20-0255 Invitation to Bid** ITB# **Department**

Description of Services or Grant Award

Jail Court Annex HVAC Renovation Project located at 4000 Aumsville Hwy SE, Salem, OR 97317

Desired BOC Session Date:	**9/18/2024**	Contract should be in DocuSign by:	**8/28/2024**
Agenda Planning Date	**9/5/2024**	Printed packets due in Finance:	**9/3/2024**
Management Update	**9/3/2024**	BOC upload / Board Session email:	**9/4/2024**

BOC Session Presenter(s) **Terry Stoner & Wesley Miller** Code: **Y**

REQUIRED APPROVALS

DocuSigned by: E4592AF8CAA542C...	8/28/2024	DocuSigned by: Vanessa K Keck 5E8DBDD1952441E...	9/6/2024
Finance - Contracts	Date	Contract Specialist	Date
Signed by: Scott Norris 60C98A6E708240B...	9/4/2024	DocuSigned by: Jan Fritz 1E984034585E453...	9/4/2024
Legal Counsel	Date	Chief Administrative Officer	Date

MARION COUNTY BOARD OF COMMISSIONERS

Board Session Agenda Review Form

Meeting date: September 18, 2024

Department: Business Services

Title: Jail Court Annex HVAC Renovation Project

Management Update/Work Session Date: September 3, 2024 **Audio/Visual aids** ☐

Time Required: 10 min **Contact:** Tamra Goettsch **Phone:** x3200

Requested Action:
Consider approval of the Public Improvement Agreement with Hermanson Company for the renovation of the HVAC system at the Marion County Court Annex located at 4000 Aumsville Hwy SE, Salem, OR 97317.

Issue, Description & Background:
The LG VRF HVAC System at the Marion County Court Annex stopped working and is too problematic and expensive to repair. Business Services is requesting approval to replace that system with a conventional HVAC System consistent with the rest of the systems at the Marion County Jail.

Financial Impacts:
Total cost $755,061.00 through CIP# 24-024

Impacts to Department & External Agencies:
No other impacts to other departments outside of Marion County Court Annex, project coordination to be managed by Business Services.

List of attachments:
Public Improvement Agreement and Attachment 1 - Specs & Drawings, CRS

Presenter:
Terry Stoner & Wesley Miller

Department Head Signature:
DocuSigned by:
Tamra Goettsch
E4D545951879444...

MARION COUNTY PUBLIC IMPROVEMENT AGREEMENT
for
Jail Court Annex HVAC Renovation Project

This Agreement for the Jail Court Annex HVAC Renovation Project (the "Agreement"), made by and between Marion County, a political subdivision of the state of Oregon, on behalf of Business Services Department, hereinafter called OWNER, and Hermanson Company hereinafter called the CONTRACTOR (collectively the “Parties”), is effective on the date this Agreement has been signed by all the Parties and all required Marion County governmental approvals have been obtained. Unless otherwise defined in the Invitation to Bid or in this Agreement, the capitalized terms used herein are defined in Section A.1 of the Marion County General Conditions for Public Improvement Contracts.

WITNESSETH:

1. Contract Price, Contract Documents and Work.
The CONTRACTOR, in consideration of the sum of $755,061.00 (the “Contract Price”), to be paid to the CONTRACTOR by OWNER in the manner and at the time hereinafter provided, and subject to the terms and conditions provided for in the Invitation to Bid, this Public Improvement Agreement and other Contract Documents, all of which are incorporated herein by reference, hereby agrees to perform all Work described and reasonably inferred from the Contract Documents.

The Contract Price includes the following items: Contractor shall be responsible to furnish all labor, material, tools, and equipment necessary to complete the Work as described in Attachment 1.

2. Representatives.
Unless otherwise specified in the Contract Documents, the OWNER designates Tamra Goettsch as its Authorized Representative in the administration of this Contract. The above-named individual shall be the initial point of contact for matters related to performance, payment, authorization, and to carry out the responsibilities of the OWNER. CONTRACTOR has named Zachary Tillotson its Authorized Representative to act on its behalf.

County delegates to the individual listed below the authority and responsibility for issuing approvals, providing notices, receiving notices, issuing directives, authorizing change orders, and avoiding and resolving disputes: Wesley Miller

3. Contract Dates.
PROJECT START DATE: October 02, 2024
SUBSTANTIAL COMPLETION: September 30, 2025
FINAL COMPLETION: November 30, 2025

4. RESERVED

5. Integration
The contract documents constitute the entire agreement between the parties. no waiver, consent, modification or change of terms of this contract 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 other understandings, agreements, or

representations, oral or written, not specified herein regarding this contract. contractor, by the signature below of its authorized representative, hereby acknowledges that it has read this contract, understands it, and agrees to be bound by its terms and conditions.

6. Authority to Execute

Contractor covenants, represents, and warrants to Owner that the person(s) executing this Contract on behalf of the Contractor have the actual authority to bind the Contractor to the terms of the Agreement.

In witness whereof, Marion County, a political subdivision of the state of Oregon, on behalf of Board of Commissioners, executes this Agreement and the CONTRACTOR does execute the same as of the day and year of this Agreement first above written.

In witness whereof, Marion County, a political subdivision of the state of Oregon, on behalf of Business Services Department, executes this Agreement and the CONTRACTOR does execute the same as of the day and year of this Agreement first above written.

7. CONTRACTOR DATA:

CONTRACTOR NAME: Hermanson Company
CONTRACTOR ADDRESS: 1260 Interior Streed
CONTRACTOR ADDRESS: Eugene, OR 97402
CONTRACTOR'S CCB # & Expiration Date:191567

CONTRACTOR'S SIGNATURE: _____
Date

MARION COUNTY SIGNATURES
BOARD OF COMMISSIONERS:

_____
Chair Date

_____
Commissioner Date

_____
Commissioner Date

Authorized Signature: DocuSigned by: Tamra Goettsch E4D545951879444... 8/29/2024
Department Director or designee Date

Authorized Signature: DocuSigned by: Jan Fritz 1E984034585E453... 9/4/2024
Chief Administrative Officer Date

Reviewed by Signature: Signed by: Scott Norris 60C98A6E708240B... 9/4/2024

Marion County Legal Counsel Date

Reviewed by Signature: DocuSigned by: E4592AF8CAA542C... 8/28/2024

Marion County Contracts & Procurement Date

MARION COUNTY

GENERAL CONDITIONS FOR PUBLIC IMPROVEMENT CONTRACTS

September 1. 2014 Edition, Revised February 14, 2022

Changes to the General Conditions (including any additions, deletions, or substitutions) should only be made by Supplemental General Conditions, unless the General Conditions are specifically modified in the Public Improvement Agreement (which has a higher order of precedence under Section A.3 of the General Conditions). The text of these General Conditions should not otherwise be altered.

TABLE OF SECTIONS

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

SECTION A GENERAL PROVISIONS

A.1 DEFINITION OF TERMS

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

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

CHANGE ORDER means a written order issued by the Owner's Authorized Representative to the Contractor requiring a change in the Work within the general scope of the Contract Documents, issued under the changes provisions of Section D.1 including Owner's written change directives as well as changes reflected in a writing executed by the parties to this Contract and, if applicable, establishing a Contract Price or Contract Time adjustment for the changed Work.

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

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

CONTRACT DOCUMENTS means the Solicitation Document and addenda thereto, the Marion County Public Improvement Agreement Form, General Conditions, Supplemental General Conditions, if any, the accepted Offer, Plans, Specifications, amendments, and Change Orders.

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

CONTRACT PRICE means the total of the awarded Offer amount, as increased or decreased by the price of approved alternates and Change Orders.

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

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

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

DIRECT COSTS means, unless otherwise provided in the Contract Documents, the cost of materials, including sales tax, cost of delivery; cost of labor, including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; worker's compensation insurance; project specific insurance (including, without limitation, Builder's Risk Insurance and Builder's Risk Installation Floater); bond premiums, rental cost of equipment, and machinery required for execution of the work; and the additional costs of field personnel directly attributable to the Work.

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

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

NOTICE TO PROCEED means the official written notice from the Owner stating that the Contractor is to proceed with the Work defined in the Contract Documents. Notwithstanding the Notice to Proceed, Contractor shall not be authorized to proceed with the Work until all initial Contract requirements, including the Contract, performance bond and payment bond, and certificates of insurance, have been fully executed and submitted to Owner in a suitable form.

OFFER means a bid in connection with an invitation to bid and a proposal in connection with a request for proposals.

OFFEROR means a bidder in connection with an invitation to bid and a proposer in connection with a request for proposals.

OVERHEAD means those items which may be included in the Contractor's markup (general and administrative expense and profit) and that shall not be charged as Direct Cost of the Work, including without limitation such Overhead expenses as wages or salary of personnel above the level of foreman (i.e., superintendents and project managers), expenses of Contractor's offices at the job site (e.g. job trailer) including expenses of personnel staffing the job site office, and Commercial General Liability Insurance and Automobile Liability Insurance.

OWNER means Marion County acting by and through the governmental entity identified in the Solicitation Document.

OWNER'S AUTHORIZED REPRESENTATIVE means those individuals identified in writing by the Owner to act on behalf of the Owner for this project. Owner may elect, by written notice to Contractor, to delegate certain duties of the Owner's Authorized Representative to more than one party, including without limitation, to an Architect/Engineer. However, nothing in these General Conditions is intended to abrogate the separate design professional responsibilities of Architects under ORS Chapter 671 or of Engineers under ORS Chapter 672.

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

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

PUNCHLIST means the list of Work yet to be completed or deficiencies which need to be corrected to achieve Final Completion of the Contract.

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

SOLICITATION DOCUMENT means an invitation to bid or request for proposal or request for quotes.

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

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

SUBSTANTIAL COMPLETION means the date when the Owner accepts in writing the construction, alteration, or repair of the improvement to real property or any designated portion thereof as having reached that state of completion when it may be used or occupied for its intended purpose. Substantial Completion of facilities with operating systems occurs only after thirty (30) continuous Days of successful, trouble-free operation of the operating systems as provided in Section K.4.2.

SUBSTITUTIONS means items that in function, performance, reliability, quality, and general configuration are the same or better than the product(s) specified. Approval of any substitute item shall be solely determined by the Owner's Authorized Representative. The decision of the Owner's Authorized Representative is final.

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

WORK means the furnishing of all materials, equipment, labor, transportation, services, and incidentals necessary to successfully complete any individual item or the entire Contract and the carrying out of duties and obligations imposed by the Contract Documents.

A.2 SCOPE OF WORK

The Work contemplated under this Contract includes all labor, materials, transportation, equipment, and services for, and incidental to, the completion of all construction work in connection with the project

described in the Contract Documents. The Contractor shall perform all Work necessary so that the project can be legally occupied and fully used for the intended use as set forth in the Contract Documents.

A.3 INTERPRETATION OF CONTRACT DOCUMENTS

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

A.3.1.1 Contract amendments and Change Orders, with those of later date having precedence over those of an earlier date;

A.3.1.2 The Supplemental General Conditions;

A.3.1.3 The Marion County Public Improvement Agreement Form;

A.3.1.4 The General Conditions

A.3.1.5 The Plans and Specifications

A.3.1.6 The Solicitation Document and any addenda thereto;

A.3.1.7 The accepted Offer.

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

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

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

A.4 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

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

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

A.4.3 Any design errors or omissions noted by the Contractor shall be reported promptly to the Owner's Authorized Representative, including without limitation, any nonconformity with applicable laws, statutes, ordinances, building codes, rules, and regulations.

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

A.5 INDEPENDENT CONTRACTOR STATUS

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

A.6 RETIREMENT SYSTEM STATUS AND TAXES

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

A.7 GOVERNMENT EMPLOYMENT STATUS

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

A.7.2 Contractor represents and warrants that Contractor is not an employee of the Marion County for purposes of performing Work under this Contract.

SECTION B ADMINISTRATION OF THE CONTRACT

B.1 OWNER'S ADMINISTRATION OF THE CONTRACT

B.1.1 The Owner's Authorized Representative will provide administration of the Contract as described in the Contract Documents (1) during construction (2) until final payment is due and (3) during the one-year period for correction of Work. The Owner's Authorized Representative will act on behalf of the Owner to the extent provided in the Contract Documents, unless modified in writing in accordance with other provisions of the Contract. In performing these tasks, the Owner's Authorized Representative may rely on the Architect/Engineer or other consultants to perform some or all of these tasks.

B.1.2 The Owner's Authorized Representative will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. The Owner's Authorized Representative will not make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Owner's Authorized Representative will neither have control over or charge of, nor be responsible for the construction means, methods, techniques, sequences, or procedures, or for the safety precautions and programs in connection with the Work.

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

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

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

B.2.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the

Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures.

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

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

B.2.4 Contractor agrees that it will commence performance of the Work in a timely manner and will achieve the Contract Times in the Contract Documents.

B.3 MATERIALS AND WORKMANSHIP

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

B.3.2 The Contractor is responsible to perform the Work as required by the Contract Documents. Defective Work shall be corrected at the Contractor's expense.

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

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

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

B.4 PERMITS

Contractor shall obtain and pay for all necessary permits and licenses, except for those specifically excluded in the Supplemental General Conditions, for the construction of the Work, for temporary obstructions, enclosures, opening of streets for pipes, walls, utilities, environmental Work, etc., as required for the project. Contractor shall be responsible for all violations of the law, in connection with the construction or caused by obstructing streets, sidewalks or otherwise. 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, Marion County, and its departments, divisions, members, and employees.

B.5 COMPLIANCE WITH GOVERNMENT LAWS AND REGULATIONS

B.5.1 Contractor shall comply with all federal, state, and local laws, codes, regulations and ordinances applicable to the Work and the Contract. Failure to comply with such requirements shall constitute a breach of Contract and shall be grounds for Contract termination. Without limiting the generality of the foregoing, Contractor expressly agrees to comply with the following as applicable: i) Title VI and VII of Civil Rights Act of 1964, as amended; (ii) Section 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Health Insurance Portability and Accountability Act of 1996; (iv) the Americans with Disabilities Act of 1990, as amended; (v) ORS Chapter 659A; as amended (vi) all regulations and administrative rules established pursuant to the foregoing laws; and (vii) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations. Owner's performance under the Contract is conditioned upon Contractor's compliance with the provisions of ORS 279C.505, 279C.510, 279C.515, 279C.520, and 279C.530, which are incorporated by reference herein.

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

B.5.2.1 Contractor shall not discriminate against Disadvantaged, Minority, Women or Emerging Small Business enterprises, as those terms are defined in ORS 200.005, or a business enterprise that is owned or controlled by or that employs a disabled veteran, as that term is defined in ORS 408.225, in the awarding of subcontracts.

B.5.2.2 Contractor shall maintain, in current and valid form, all licenses and certificates required by law, regulation, or this Contract when performing the Work.

B.5.3 Unless contrary to federal law, Contractor shall certify that it 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.

B.5.4 Unless contrary to federal law, 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.

B.5.5 The following notice is applicable to Contractors who perform excavation Work. ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the center at (503)232-1987.

B.5.6 Failure to comply with any or all of the requirements of B.5.1 through B.5.5 shall be a breach of Contract and constitute grounds for Contract termination. Damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

B.6 SUPERINTENDENCE

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

B.7 INSPECTION

B.7.1 Owner's Authorized Representative shall have access to the Work at all times.

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

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

B.7.4 As required by the Contract Documents, Work done, or material used without inspection or testing by the Owner's Authorized Representative may be ordered removed at the Contractor's expense.

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

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

B.7.7 When the United States government participates in the cost of the Work, or the Owner has an agreement with other public or private organizations, or if any portion of the Work is being performed for a third party or near third party facilities, representatives of these organizations have the right to inspect the Work affecting their interests or property. Their right to inspect shall not make them a

party to the Contract and shall not interfere with the rights of the parties of the Contract. Instructions or orders of such parties shall be transmitted to the Contractor, through the Owner's Authorized Representative.

B.8 SEVERABILITY

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

B.9 ACCESS TO RECORDS

B.9.1 Contractor shall keep, at all times on the Work site, one record copy of the complete Contract Documents, including the Plans, Specifications, Change Orders and addenda, in good order and marked currently to record field changes and selections made during construction, and one record copy of Shop Drawings, Product Data, Samples and similar submittals, and shall at all times give the Owner's Authorized Representative access thereto.

B.9.2 Contractor shall retain and the Owner and its duly authorized representatives shall have access to, for a period not less than ten (10) years, all Record Documents, financial and accounting records, and other books, documents, papers, and records of Contractor which are pertinent to the Contract including records pertaining to Overhead and indirect costs, for the purpose of making audit, examination, excerpts, and transcripts. If for any reason, any part of the Contract is involved in litigation, Contractor shall retain all such records until all litigation is resolved. The Owner and/or its agents shall continue to be provided full access to the records during litigation.

B.10 WAIVER

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

B.11 SUBCONTRACTS AND ASSIGNMENT

B.11.1 Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound by the terms and conditions of these General Conditions, and to assume toward the Contractor all of the obligations and responsibilities which the Contractor assumes toward the Owner thereunder, unless (1) the same are clearly inapplicable to the subcontract at issue because of legal requirements or industry practices, or (2) specific exceptions are requested by Contractor and approved in writing by Owner. Where appropriate, Contractor shall require each Subcontractor to enter into similar agreements with sub-subcontractors at any level.

B.11.2 At Owner’s request, Contractor shall submit to Owner prior to their execution either Contractor’s form of subcontract, or the subcontract to be executed with any particular Subcontractor. If Owner disapproves such form, Contractor shall not execute the form until the matters disapproved are resolved to Owner’s satisfaction. Owner’s review, comment upon or approval of any such form shall not relieve Contractor of its obligations under this Agreement or be deemed a waiver of such obligations of Contractor.

B.11.3 Contractor shall not assign, sell, or transfer its rights, or delegate its responsibilities under this Contract, in whole or in part, without the prior written approval of the Owner. No such written

approval shall relieve Contractor of any obligations of this Contract, and any transferee shall be considered the agent of the Contractor and bound to perform in accordance with the Contract Documents. Contractor shall remain liable as between the original parties to the Contract as if no assignment had occurred.

B.12 SUCCESSORS IN INTEREST

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

B.13 OWNER'S RIGHT TO DO WORK

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

B.14 OTHER CONTRACTS

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

B.15 GOVERNING LAW

This Contract shall be governed by and construed in accordance with the laws of the State of Oregon without regard to principles of conflict of laws.

B.16 LITIGATION

Any Claim between Owner and Contractor that arises from or relates to this Contract and that is not resolved through the Claims Review Process in Section D.3 shall be brought and conducted solely and exclusively within the Circuit Court of Marion County for the State of Oregon; provided, however, if a Claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. In no event shall this section be construed as a waiver by the Marion County on any form of defense or immunity, whether sovereign immunity, governmental immunity, immunity based on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court. CONTRACTOR BY EXECUTION OF THIS CONTRACT HEREBY CONSENTS TO THE IN PERSONAM JURISDICTION OF THE COURTS REFERENCED IN THIS SECTION B.16.

B.17 ALLOWANCES

B.17.1 The Contractor shall include in the Contract Price all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct.

B.17.2 Unless otherwise provided in the Contract Documents:

B.17.2.1 when finally reconciled, allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

B.17.2.2 Contractor's costs for unloading and handling at the site, labor, installation costs, Overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Price but not in the allowances;

B.17.2.3 whenever costs are more than or less than allowances, the Contract Price shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect

(a) the difference between actual costs and the allowances under Section B.17.2.1 and

(b) changes in Contractor's costs under Section B.17.2.2.

B.17.2.4 Unless Owner requests otherwise, Contractor shall provide to Owner a proposed fixed price for any allowance work prior to its performance.

B.18 SUBMITTALS, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

B.18.1 The Contractor shall prepare and keep current, for the Architect's/Engineer's approval (or for the approval of Owner's Authorized Representative if approval authority has not been delegated to the Architect/Engineer), a schedule and list of submittals which is coordinated with the Contractor's construction schedule and allows the Architect/Engineer reasonable time to review submittals. Owner reserves the right to finally approve the schedule and list of submittals. Submittals include, without limitation, Shop Drawings, Product Data, and Samples which are described below:

B.18.1.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor (including any sub-subcontractor), manufacturer, supplier, or distributor to illustrate some portion of the Work.

B.18.1.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

B.18.1.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

B.18.2 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review of submittals by the Architect/Engineer is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, or for approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any construction means, methods, techniques, sequences or procedures, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's submittals shall not relieve the Contractor of its obligations under the Contract Documents. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which

the item is a component. Informational submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.

B.18.3 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect/Engineer Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect/Engineer without action.

B.18.4 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

B.18.5 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect/Engineer.

B.18.6 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect/Engineer's review or approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and (i) the Architect/Engineer has given written approval to the specific deviation as a minor change in the Work, or (ii) a Change Order has been executed by Owner authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar by the Architect/Engineer's review or approval thereof.

B.18.7 In the event that Owner elects not to have the obligations and duties described under this Section B.18 performed by the Architect/Engineer, or in the event no Architect/Engineer is employed by Owner on the project, all obligations and duties assigned to the Architect/Engineer hereunder shall be performed by the Owner's Authorized Representative.

B.19 SUBSTITUTIONS

The Contractor may make Substitutions only with the consent of the Owner, after evaluation by the Owner's Authorized Representative and only if price or time change must be made through a Change Order, all other substitutions may be communicated through email. Substitutions shall be subject to the requirements of the bid documents. By making requests for Substitutions, the Contractor represents that the Contractor has personally investigated the proposed substitute product; represents that the Contractor will provide the same warranty for the Substitution that the Contractor would for the product originally specified unless approved otherwise; certifies that the cost data presented is complete and includes all related costs under this Contract including redesign costs, and waives all claims for additional costs related to the Substitution which subsequently become apparent; and will coordinate the installation of the accepted Substitution, making such changes as may be required for the Work to be completed in all respects.

B.20 USE OF PLANS AND SPECIFICATIONS

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

B.21 FUNDS AVAILABLE AND AUTHORIZED

Owner reasonably believes at the time of entering into this Contract that sufficient funds are available and authorized for expenditure to finance the cost of this Contract within the Owner's appropriation or limitation. Contractor understands and agrees that, to the extent that in the event the Board of Commissioners of the County reduces, changes, eliminates, or otherwise modifies the funding the cost of this contract, the CONTRACTOR agrees to abide by any such decision, including termination of this agreement.

B.22 NO THIRD-PARTY BENEFICIARIES

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

SECTION C WAGES AND LABOR

C.1 MINIMUM WAGE RATES ON PUBLIC WORKS

Contractor shall comply fully with the provisions of ORS 279C.800 through 279C.870. Documents establishing those conditions, as determined by the Commissioner of the Bureau of Labor and Industries (BOLI), are included as attachments to or are incorporated by reference in the Contract Documents. Contractor shall pay workers at not less than the specified minimum hourly rate of wage, and shall include that requirement in all subcontracts.

C.2 PAYROLL CERTIFICATION; ADDITIONAL RETAINAGE; FEE REQUIREMENTS

C.2.1 In accordance with ORS 279C.845, the Contractor and every Subcontractor shall submit written certified statements to the Owner's Authorized Representative, on the form prescribed by the Commissioner of the Bureau of Labor and Industries, certifying the hourly rate of wage paid each worker which the Contractor or the Subcontractor has employed on the project and further certifying that no worker employed on the project has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the Contract, which certificate and statement shall be verified by the oath of the Contractor or the Subcontractor that the Contractor or Subcontractor has read the certified statement, that the Contractor or Subcontractor knows the contents of the certified statement and that to the Contractor's or Subcontractor's best knowledge and belief the certified statement is true. The certified statements shall set out accurately and completely the payroll records for the prior week including the name and address of each worker, the worker's correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid. Certified statements for each week during which the Contractor or Subcontractor has employed a

worker on the project shall be submitted once a month, by the fifth business day of the following month.

The Contractor and Subcontractors shall preserve the certified statements for a period of ten (10) years from the date of completion of the Contract.

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

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

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

C.3 PROMPT PAYMENT AND CONTRACT CONDITIONS

C.3.1 Pursuant to ORS 279C.505 and as a condition to Owner's performance hereunder, the Contractor shall:

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

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

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

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

C.3.1.5 Demonstrate that an employee drug testing program is in place as follows:

(a) Contractor represents and warrants that Contractor has in place at the time of the execution of this Contract, and shall maintain during the term of this Contract, a Qualifying Employee Drug Testing Program for its employees that includes, at a minimum, the following:

(1) A written employee drug testing policy,

(2) 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

(3) Required testing of a Subject Employee when the Contractor has reasonable cause to believe the Subject Employee is under the influence of drugs.

A drug testing program that meets the above requirements will be deemed a "Qualifying Employee Drug Testing Program." For the purposes of this section, an employee is a "Subject Employee" only if that employee will be working on the project job site.

(b) Contractor shall require each Subcontractor providing labor for the project to:

(1) 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

(2) Require that the Subcontractor's Subject Employees participate in the Contractor's Qualifying Employee Drug Testing Program for the duration of the subcontract.

C.3.2 Pursuant to ORS 279C.515, and as a condition to Owner's performance hereunder, Contractor agrees:

C.3.2.1 If Contractor fails, neglects or refuses to pay promptly a person's claim for labor or services that the person provides to the Contractor or a Subcontractor in connection with the project as such claim becomes due, the proper officer that represents the Owner may pay the amount of the claim and charge the amount of the payment against funds due or to become due Contractor under this Contract. Paying a claim in this manner shall not relieve the Contractor or the Contractor's surety from obligation with respect to an unpaid claim.

C.3.2.2 If the Contractor or a first-tier Subcontractor fails, neglects or refuses to pay a person that provides labor or materials in connection with the public contract for a public improvement within thirty (30) Days after receiving payment from Owner or a contractor, the contractor or first-tier Subcontractor owes the person the amount due plus interest charges that begin at the end of the 10-Day period within which payment is due under ORS 279C.580(4) and that end upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest on the amount due is nine percent per annum. The amount of interest may not be waived.

C.3.2.3 If the Contractor or a Subcontractor fails, neglects or refuses to pay a person that provides labor or materials in connection with the Contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580. Every contract related to this Contract must contain a similar clause.

C.3.3 Pursuant to ORS 279C.580, Contractor shall include in each subcontract for property or services the Contractor enters into with a first-tier Subcontractor, including a material supplier, for the purpose of performing a construction contract:

C.3.3.1 A payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under the subcontract within ten (10) Days out of amounts the Owner pays to the Contractor under the Contract;

C.3.3.2 A clause that requires the Contractor to provide the first-tier Subcontractor with a standard form that the first-tier Subcontractor may use as an application for payment or as another method by which the Subcontractor may claim a payment due from the Contractor;

C.3.3.3 A clause that requires the Contractor, except as otherwise provided in this paragraph, to use the same form and regular administrative procedures for processing payments during the entire term of the subcontract. The Contractor may change the form or the regular administrative procedures the Contractor uses for processing payments if the Contractor:

(a) Notifies the Subcontractor in writing at least 45 days before the date on which the Contractor makes the change; and

(b) Includes with the written notice a copy of the new or changed form or a description of the new or changed procedure.

C.3.3.4 An interest penalty clause that obligates the Contractor, if the Contractor does not pay the first-tier Subcontractor within thirty (30) Days after receiving payment from Owner, to pay the first-tier Subcontractor an interest penalty on amounts due in each payment the Contractor does not make in accordance with the payment clause included in the subcontract under Section C.3.3.1 of this subsection. Contractor or first-tier Subcontractor is not obligated to pay an interest penalty if the only reason that the Contractor or first-tier Subcontractor did not make payment when payment was due is that the Contractor or first-tier Subcontractor did not receive payment from Owner or Contractor when payment was due. The interest penalty applies to the period that begins on the day after the required payment date and that ends on the date on which the amount due is paid; and is computed at the rate specified in ORS 279C.515(2).

C.3.3.5 A clause which requires each of Contractor's Subcontractors to include, in each of their contracts with lower-tier Subcontractors or suppliers, provisions to the effect that the first- tier Subcontractor shall pay its lower-tier Subcontractors and suppliers in accordance with the provisions of paragraphs C.3.3.1 through C.3.3.4 above and requiring each of their Subcontractors and suppliers to include such clauses in their subcontracts and supply contracts.

C.3.4 All employers, including Contractor, that employ subject workers who work under this contract in the Marion County shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its Subcontractors complies with these requirements.

C.4 PAYMENT FOR MEDICAL CARE

Pursuant to ORS 279C.530, and as a condition to Owner's performance hereunder, Contractor shall promptly, as due, make payment to any person, partnership, association or corporation furnishing medical, surgical, and hospital care or other needed care and attention, incident to sickness or injury, to the employees of such Contractor, all sums of which the Contractor agrees to pay for such services and all moneys and sums which the Contractor has collected or deducted from the wages of personnel pursuant to any law, contract or agreement for the purpose of providing or paying for such services.

C.5 HOURS OF LABOR

As a condition to Owner's performance hereunder, Contractor shall comply with ORS 279C.520, as amended from time to time and incorporated herein by this reference:

Pursuant to ORS 279C.520 and as a condition to Owner's performance hereunder, no person shall be employed to perform Work under this Contract for more than ten (10) hours in any one day or forty (40) hours in any one week, except in cases of necessity, emergency or where public policy absolutely requires it. In such instances, Contractor shall pay the employee at least time and a half pay:

C.5.1 For all overtime in excess of eight (8) hours a day or forty (40) hours in any one week when the work week is five consecutive Days, Monday through Friday; or

C.5.2 For all overtime in excess of ten (10) hours a day or forty (40) hours in any one week when the work week is four consecutive Days, Monday through Friday; and

C.5.3 For all Work performed on Saturday and on any legal holiday specified in ORS 279C.540.

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

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

SECTION D CHANGES IN THE WORK

D.1 CHANGES IN WORK

D.1.1 The terms of this Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever without prior written approval of the Owner's Authorized Representative, and then only in a manner consistent with the Change Order provisions of this Section D.1 and after any necessary approvals required by public contracting laws have been obtained. Otherwise, a formal contract amendment is required, which shall not be effective until its execution by the parties to this Contract and all approvals required by public contracting laws have been obtained.

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

D.1.2.1 Modification of specifications and design.

D.1.2.2 Increases or decreases in quantities.

D.1.2.3 Increases or decreases to the amount of Work.

D.1.2.4 Addition or elimination of any Work item.

D.1.2.5 Change in the duration of the project.

D.1.2.6 Acceleration or delay in performance of Work.

D.1.2.7 Deductive changes.

Deductive changes are those that reduce the scope of the Work, and shall be made by mutual agreement whenever feasible, as determined by Owner. In cases of suspension or partial termination under Section J, Owner reserves the right to unilaterally impose a deductive change and to self-perform such Work, for which the provisions of B.13 (Owner's Right to Do Work) shall then apply.

Adjustments in compensation shall be made under the provisions of D.1.3, in which costs for deductive changes shall be based upon a Direct Costs adjustment together with the related percentage markup specified for profit, Overhead and other indirect costs, unless otherwise agreed to by Owner.

D.1.3 The Owner and Contractor agree that Change Order Work shall be administered and compensated according to the following:

D.1.3.1 Unit pricing may be utilized at the Owner's option when unit prices or solicitation alternates were provided that established the cost for additional Work, and a binding obligation exists under the Contract on the parties covering the terms and conditions of the additional Work.

D.1.3.2 If the Owner elects not to utilize unit pricing, or in the event that unit pricing is not available or appropriate, fixed pricing may be used for Change Order Work. In fixed pricing the basis of payments or total price shall be agreed upon in writing between the parties to the Contract, and shall be established before the Work is done whenever feasible. The mark-ups set forth in D.1.3.3 shall be utilized by the parties as a guide in establishing fixed pricing, and will not be exceeded by Owner without adequate justification. Cost and price data relating to Change Orders shall be supplied by Contractor to Owner upon request, but Owner shall be under no obligation to make such requests.

D.1.3.3 In the event that unit pricing and fixed pricing are not utilized, then Change Order Work shall be performed on a cost reimbursement basis for Direct Costs. Such Work shall be compensated on the basis of the actual, reasonable and allowable cost of labor, equipment, and material furnished on the Work performed. In addition, the following markups shall be added to the Contractor's or Subcontractor's Direct Costs as full compensation for profit, Overhead and other indirect costs for Work directly performed with the Contractor's or Subcontractor's own forces:

On Labor..... 15%
On Equipment..... 10%
On Materials..... 10%

When Change Order Work under D.1.3.3 is invoiced by an authorized Subcontractor at any level, each ascending tier Subcontractor or Contractor will be allowed a 5% supplemental mark-up on each piece of subcontract Work covered by such Change Order.

Payments made to the Contractor shall be complete compensation for Overhead, profit, and all costs that were incurred by the Contractor or by other forces furnished by the Contractor,

including Subcontractors, for Change Order Work. Owner may establish a maximum cost for Change Order Work under this Section D.1.3.3, which shall not be exceeded for reimbursement without additional written authorization from Owner. Contractor shall not be required to complete such Change Order Work without additional authorization.

D.1.4 Any necessary adjustment of Contract Time that may be required as a result of a Change Order must be agreed upon by the parties before the start of the Change Order Work unless Owner's Authorized Representative authorizes Contractor to start the Work before agreement on Contract Time adjustment. Contractor shall submit any request for additional compensation (and additional Contract Time if Contractor was authorized to start Work before an adjustment of Contract Time was approved) as soon as possible but no later than thirty (30) Days after receipt of the Change Order. If Contractor's request for additional compensation or adjustment of Contract Time is not made within the thirty (30) day time limit, Contractor's requests pertaining to that Change Order are barred. The thirty (30) day time limit for making requests shall not be extended for any reason, including without limitation Contractor's claimed inability to determine the amount of additional compensation or adjustment of Contract Time, unless an extension is granted in writing by Owner. If the Owner's Authorized Representative denies Contractor's request for additional compensation or adjustment of Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process. No other reimbursement, compensation, or payment will be made, except as provided in Section D.1.5 for impact claims.

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

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

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

D.1.6 No request or Claim by the Contractor for additional costs or an extension of Contract Time shall be allowed if made after receipt of final payment application under this Contract. Contractor agrees to submit its final payment application within ninety (90) days after Substantial Completion, unless written extension is granted by Owner. Contractor shall not delay final payment application for any reason, including without limitation nonpayment of Subcontractors, suppliers, manufacturers or others not a party to this Contract, or lack of resolution of a dispute with Owner or any other person of matters arising out of or relating to the Contract. If Contractor fails to submit its final payment application within ninety (90) days after Substantial Completion, and Contractor has not obtained written extension by Owner, all requests or Claims for additional costs or an extension of Contract Time shall be waived.

D.1.7 It is understood that changes in the Work are inherent in construction of this type. The number of changes, the scope of those changes, and the effect they have on the progress of the original Work cannot be defined at this time. The Contractor is notified that numerous changes may be required and that there will be no compensation made to the Contractor directly related to the number of changes. Each change will be evaluated for extension of Contract Time and increase or decrease in compensation based on its own merit.

D.2 DELAYS

D.2.1 Delays in construction include "Avoidable Delays", which are defined in Section D.2.1.1, and "Unavoidable Delays", which are defined in Section D.2.1.2. The effect of Avoidable Delays is described in Section D.2.2 and the effect of Unavoidable Delays is described in Section D.2.3.

D.2.1.1 Avoidable Delays include any delays other than Unavoidable Delays, and include delays that otherwise would be considered Unavoidable Delays but that:

(a) Could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.

(b) Affect only a portion of the Work and do not necessarily prevent or delay the prosecution of other parts of the Work nor the completion of the whole Work within the Contract Time.

(c) Do not impact activities on the accepted critical path schedule.

(d) Are associated with the reasonable interference of other contractors employed by the Owner that do not necessarily prevent the completion of the whole Work within the Contract Time.

D.2.1.2 Unavoidable Delays include delays other than Avoidable Delays that are:

(a) Caused by any actions of the Owner, Owner's Authorized Representative, or any other employee or agent of the Owner, or by separate contractor employed by the Owner.

(b) Caused by any site conditions which differ materially from what was represented in the Contract Documents or from conditions that would normally be expected to exist and be

inherent to the construction activities defined in the Contract Documents. The Contractor shall notify the Owner's Authorized Representative immediately of differing site conditions before the area has been disturbed, but not more than fourteen (14) days after the condition has been encountered. The Owner's Authorized Representative will investigate the area and make a determination as to whether or not the conditions differ materially from either the conditions stated in the Contract Documents or those which could reasonably be expected in execution of this particular Contract. If Contractor and the Owner's Authorized Representative agree that a differing site condition exists, any additional compensation or additional Contract Time will be determined based on the process set forth in Section D.1.5 for Change Order Work. If the Owner's Authorized Representative disagrees that a differing site condition exists and denies Contractor's request for additional compensation or Contract Time, Contractor may proceed to file a Claim under Section D.3, Claims Review Process.

(c) Caused by Force Majeure acts, events or occurrences that could not have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or its Subcontractors.

(d) Caused by adverse weather conditions. Any adverse weather conditions must be substantiated by documentary evidence that weather conditions were abnormal for the specific time period claimed, could not have been anticipated by the Contractor, and adversely impacted the project in a manner that could not be avoided by rescheduling the Work or by implementing measures to protect against the weather so that the Work could proceed. A rain, windstorm, high water, or other natural phenomenon for the specific locality of the Work, which might reasonably have been anticipated from the previous 10-year historical records of the general locality of the Work, shall not be construed as abnormal. The parties agree that rainfall greater than the following levels cannot be reasonably anticipated:

(1) Daily rainfall equal to, or greater than, 0.50 inch during a month when the monthly rainfall exceeds the normal monthly average by twenty-five percent (25 %) or more.

(2) daily rainfall equal to, or greater than, 0.75 inch at any time.

The Office of the Environmental Data Service of the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce nearest the project site shall be considered the official agency of record for weather information.

D.2.2 Except as otherwise provided in ORS 279C.315, Contractor shall not be entitled to additional compensation or additional Contract Time for Avoidable Delays.

D.2.3 In the event of Unavoidable Delays, based on principles of equitable adjustment, Contractor may be entitled to the following:

D.2.3.1 Contractor may be entitled to additional compensation or additional Contract Time, or both, for Unavoidable Delays described in Section D.2.1.2 (a) and (b).

D.2.3.2 Contractor may be entitled to additional Contract Time for Unavoidable Delays described in Section D.2.1.2 (c) and (d).

In the event of any requests for additional compensation or additional Contract Time, or both, as applicable, arising under this Section D.2.3 for Unavoidable Delays, other than requests for additional compensation or additional Contract Time for differing site conditions for which a review process is established under Section D.2.1.2 (b), Contractor shall submit a written notification of the delay to the Owner's Authorized Representative within two (2) Days of the occurrence of the cause of the delay. This written notification shall state the cause of the potential delay, the project components impacted by the delay, and the anticipated additional Contract Time or the additional compensation, or both, as applicable, resulting from the delay. Within seven (7) Days after the cause of the delay has been mitigated, or in no case more than thirty (30) Days after the initial written notification, the Contractor shall submit to the Owner's Authorized Representative, a complete and detailed request for additional compensation or additional Contract Time, or both, as applicable, resulting from the delay.

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

If Contractor does not timely submit the notices required under this Section D.2., then unless otherwise prohibited by law, Contractor's Claim shall be barred.

D.3 CLAIMS REVIEW PROCESS

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

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

D.3.3 The Owner's Authorized Representative will review all Claims and take one or more of the following preliminary actions within ten (10) Days of receipt of the Detailed Notice of a Claim: (1) request additional supporting information from the Contractor; (2) inform the Contractor and Owner in writing of the time required for adequate review and response; (3) reject the Claim in whole or in part

and identify the reasons for rejection; (4) based on principles of equitable adjustment, recommend approval of all or part of the Claim; or (5) propose an alternate resolution.

D.3.4 The Owner's Authorized Representative's decision shall be final and binding on the Contractor unless appealed by written notice to the Owner within fifteen (15) Days of receipt of the decision. The Contractor must present written documentation supporting the Claim within fifteen (15) Days of the notice of appeal. After receiving the appeal documentation, the Owner, through its Chief Administrative Officer (CAO), shall review the materials and render a decision within thirty (30) Days after receiving the appeal documents.

D.3.5 The decision of the Owner shall be final and binding unless the Contractor delivers to the Owner its requests for mediation, which shall be a non-binding process, within fifteen (15) Days of the date of the Owner's decision.

D.3.6 The parties are fully committed to working with each other throughout the Project and agree to communicate regularly with each other at all times so as to avoid or minimize disputes or disagreements. If disputes or disagreements do arise, Contractor and Owner each commit to resolving such disputes or disagreements in an amicable, professional and expeditious manner so as to avoid unnecessary losses, delays and disruptions to the Work.

D.3.7 The mediation process will be considered to have commenced as of the date the Contractor delivers the request. Both parties acknowledge and agree that participation in mediation is a prerequisite to commencement of litigation of any disputes relating to the Contract. Both parties further agree to exercise their best efforts in good faith to resolve all disputes within sixty (60) Days of the commencement of the mediation through the mediation process set forth herein.

In the event that a lawsuit must be filed within this sixty (60) day period in order to preserve a cause of action, the parties agree that notwithstanding the filing, they shall proceed diligently with the mediation to its conclusion prior to actively prosecuting the lawsuit, and shall seek from the Court in which the lawsuit is pending such stays or extensions, including the filing of an answer, as may be necessary to facilitate the mediation process. Further, in the event settlements are reached on any issues through mediation, the parties agree to promptly submit the appropriate motions and orders documenting the settlement to the Court for its signature and filing.

D.3.8 The mediator shall be an individual mutually acceptable to both parties, but in the absence of agreement each party shall select a temporary mediator and the temporary mediators shall jointly select the permanent mediator. Each party shall pay its own costs for the time and effort involved in mediation. The cost of the mediator shall be split equally between the two parties. Both parties agree to exercise their best effort in good faith to resolve all disputes in mediation. Participation in mediation is a mandatory requirement of both the Owner and the Contractor. The schedule, time and place for mediation will be mutually acceptable, or, failing mutual agreement, shall be as established by the mediator. The parties agree to maintain the confidentiality of mediation, if any, and shall execute all necessary documents to give effect to such confidentiality to the extent allowed by law. In any event, the parties shall not subpoena the mediator or otherwise require the mediator to produce records, notes or work product, or to testify in any future proceedings as to information disclosed or representations made in the course of mediation, except to the extent disclosure is required by law.

D.3.9 Owner may at any time and at its discretion issue a construction change directive adding to, modifying or reducing the scope of Work. Contractor and Owner shall negotiate the need for any additional compensation or additional Contract Time related to the change, subject to the procedures for submitting requests or Claims for additional compensation or additional Contract Time established in this Section D. Unless otherwise directed by Owner's Authorized Representative, Contractor shall proceed with the Work while any request or Claim is pending, including but not limited to, a request or Claim for additional compensation or additional Contract Time resulting from Work under a Change Order or construction change directive. Regardless of the review period or the final decision of the Owner's Authorized Representative, the Contractor shall continue to diligently pursue the Work as identified in the Contract Documents. In no case is the Contractor justified or allowed to cease Work without a written stop work order from the Owner or Owner's Authorized Representative.

SECTION E PAYMENTS

E.1 SCHEDULE OF VALUES

The Contractor shall submit, at least ten (10) Days prior to submission of its first application for progress payment, a schedule of values ("Schedule of Values") for the contracted Work. This schedule will provide a breakdown of values for the contracted Work and will be the basis for progress payments. The breakdown will demonstrate reasonable, identifiable, and measurable components of the Work. Unless objected to by the Owner's Authorized Representative, this schedule shall be used as the basis for reviewing Contractor's applications for payment. If objected to by Owner's Authorized Representative, Contractor shall revise the schedule of values and resubmit the same for approval of Owner's Authorized Representative.

E.2 APPLICATIONS FOR PAYMENT

E.2.1 Owner shall make progress payments on the Contract monthly as Work progresses. Payments shall be based upon estimates of Work completed and the Schedule of Values. All payments shall be approved by the Owner's Authorized Representative. A progress payment shall not be considered acceptance or approval of any Work or waiver of any defects therein. Owner shall pay to Contractor interest on the progress payment, not including retainage, due the Contractor. The interest shall commence thirty (30) Days after the receipt of invoice ("application for payment") from the Contractor or fifteen (15) Days after the payment is approved by the Owner's Authorized Representative, whichever is the earlier date. The rate of interest 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 thirty (30) Days after receipt of the application for payment from the Contract or fifteen (15) Days after the payment is approved by the Owner, whichever is the earlier date, but the rate of interest shall not exceed thirty (30) percent. Notwithstanding the foregoing, in instances when an application for payment is filled out incorrectly, or when there is any defect or impropriety in any submitted application or when there is a good faith dispute, Owner shall so notify the Contractor within fifteen (15) Days stating the reason or reasons the application for payment is defective or improper or the reasons for the dispute. A defective or improper application for payment, if corrected by the Contractor within seven (7) Days of being notified by the Owner, shall not cause a payment to be made later than specified in this section unless interest is also paid. Accrual of interest will be postponed when payment on the principal is delayed because of disagreement between the Owner and the Contractor.

Owner reserves the right, instead of requiring the Contractor to correct or resubmit a defective or improper application for payment, to reject the defective or improper portion of the application for payment and pay the remainder of the application for payment that is correct and proper. Owner makes this election; the Contractor will be required to arrange to receive EFT/ACH payments.

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

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

Signed: _____”

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

E.2.3.1 The request for stored material shall be submitted at least thirty (30) Days in advance of the application for payment on which it appears. Applications for payment shall be entertained for major equipment, components or expenditures only.

E.2.3.2 The Contractor shall submit applications for payment showing the quantity and cost of the material stored.

E.2.3.3 The material shall be stored in a bonded warehouse and Owner's Authorized Representative shall be granted the right to access the material for the purpose of removal or inspection at any time during the Contract Period.

E.2.3.4 The Contractor shall name the Owner as co- insured on the insurance policy covering the full value of the property while in the care and custody of the Contractor until it is installed. A certificate noting this coverage shall be issued to the Owner.

E.2.3.5 Payments shall be made for materials only. The submitted amount of the application for payment shall be reduced by the cost of transportation and for the cost of an inspector to check the delivery at out of town storage sites. The cost of said inspection shall be borne solely by the Contractor.

E.2.3.6 Within sixty (60) Days of the application for payment, the Contractor shall submit evidence of payment covering the material stored.

E.2.3.7 Payment for stored materials shall in no way indicate acceptance of the materials or waive any rights under this Contract for the rejection of the Work or materials not in conformance with the Contract Documents.

E.2.3.8 All required documentation must be submitted with the respective application for payment.

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

E.2.4.1 Work that is defective and not remedied, or that has been demonstrated or identified as failing to conform with the Contract Documents,

E.2.4.2 third party claims filed or evidence reasonably indicating that such claims will likely be filed unless security acceptable to the Owner is provided by the Contractor;

E.2.4.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment (in which case Owner may issue checks made payable jointly to Owner and such unpaid persons under this provision, or directly to Subcontractors and suppliers at any level under Section C.3.2.1);

E.2.4.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;

E.2.4.5 damage to the Owner or another contractor;

E.2.4.6 reasonable evidence that the Work will not be completed within the Contract Time required by the Contract, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

E.2.4.7 failure to carry out the Work in accordance with the Contract Documents; or

E.2.4.8 assessment of liquidated damages when withholding is made for offset purposes.

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

E.2.5.1 Take that portion of the Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Price allocated to that portion of the Work in the Schedule of Values, less retainage as provided in Section E.5. Pending final determination of cost to the Owner of changes in the Work, no amounts for changes in the Work can be included in application for payment until the Contract Price has been adjusted by Change Order;

E.2.5.2 Add that portion of the Contract Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner pursuant to Section E.2.3, suitably stored off the site at a location agreed upon in writing), less retainage as provided in Section E.5;

E.2.5.3 Subtract the aggregate of previous payments made by the Owner; and

E.2.5.4 Subtract any amounts for which the Owner's Authorized Representative has withheld or nullified payment as provided in the Contract Documents.

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

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

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

E.3 PAYROLL CERTIFICATION REQUIREMENT

Payroll certification is required before payments are made on the Contract. Refer to Section C.2 for this information.

E.4 DUAL PAYMENT SOURCES

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

E.5 RETAINAGE

E.5.1 Retainage shall be withheld and released in accordance with ORS 279C.550 to 279C.580:

E.5.1.1 Owner reserves the right in its sole discretion to not withhold retainage from progress payments or to begin withholding retainage at any time. If Owner withholds retainage from progress payments the amount to be retained will not exceed five percent of the payment. As Work progresses, Owner 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 Owner's opinion, such Work is progressing satisfactorily. Elimination or reduction of retainage shall be allowed only upon written application by the Contractor, which application shall include written approval of Contractor's surety; except that when the Work is 97-1/2 percent completed the Owner may, at its discretion and without application by the Contractor, reduce the retained amount to 100 percent of the value of the Work remaining to be done. Upon receipt of written application by the Contractor, Owner shall respond in writing within a reasonable time.

E.5.1.2 If retainage is withheld, unless the Contractor requests and the Owner accepts a form of retainage described in options (a) or (b) below, the Owner will deposit that retainage in an interest-bearing account, established through the Owner, in a bank, savings bank, trust company or savings association for the benefit of Owner, with interest from such account accruing to the Contractor as required by ORS 279C.560. In accordance with the provisions of ORS 279C.560 and any applicable administrative rules, unless the Owner finds in writing that accepting bonds, securities or other instruments described in option (a) below or a security bond described in option (b)

below poses an extraordinary risk that is not typically associated with the bond, security or instrument, the Owner will approve the Contractor's written request:

(a) to be paid amounts which would otherwise have been retained from progress payments where Contractor has deposited acceptable bonds, securities or other instruments of equal value with Owner or in a custodial account or other mutually agreed account satisfactory to Owner, with an approved bank or trust company to be held in lieu of the cash retainage for the benefit of Owner. Interest or earnings on the bonds, securities or other instruments shall accrue to the Contractor. The Contractor shall execute and provide such documentation and instructions respecting the bonds, securities and other instruments as the Owner may require to protect its interests. To be permissible the bonds, securities and other instruments must be of a character approved by the Chief Administrative Officer, including but not limited to:

(1) Bills, certificates, notes or bonds of the United States.

(2) Other obligations of the United States or agencies of the United States.

(3) Obligations of a corporation wholly owned by the federal government.

(4) Indebtedness of the Federal National Mortgage Association.

(5) General obligation bonds of the State of Oregon or a political subdivision of the State of Oregon.

(6) Irrevocable letters of credit issued by an insured institution, as defined in ORS 706.008; or

(b) that the Contractor be allowed, with the approval of the Owner, to deposit a surety bond for the benefit of Owner, in a form acceptable to Owner, in lieu of all or a portion of funds retained, or to be retained. Such bond and any proceeds therefrom shall be made subject to all claims and liens in the manner and priority as set forth for retainage under ORS 279C.550 to 279C.570 and 279C.600 to ORS 279C.625.

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

(c) For a contract over $500,000, if the Contractor requests that the Owner deposit the retainage in an interest-bearing escrow account under ORS 279C.570(2), the Contractor shall execute such documentation and instructions respecting the interest-bearing escrow account as the Owner may require to protect its interests, including but not limited to a provision that no funds may be paid from the account to anyone without the Owner's advance written authorization.

(d) For a contract of $500,000 or less, the Owner shall deposit the retainage in an interest-bearing account under ORS 279C.560(5). The Owner will use an interest-bearing account in a bank, savings bank, trust company or savings association as provided under ORS 279C.560(5).

E.5.1.3 The retainage held by Owner shall be included in and paid to the Contractor as part of the final payment of the Contract Price. The Owner shall pay to Contractor interest at the rate of one and one-half percent per month on the final payment due Contractor, interest to commence thirty (30) Days after the Work under the Contract has been completed and accepted and to run until the date Contractor shall notify Owner in writing when the Contractor considers the Work complete and Owner shall, within fifteen (15) Days after receiving the written notice, either accept the Work or notify the Contractor of Work yet to be performed on the Contract. If Owner does not within the time allowed notify the Contractor of Work yet to be performed to fulfill contractual obligations, the interest provided by this subsection shall commence to run thirty (30) Days after the end of the 15-Day period.

E.5.1.4 In accordance with the provisions of ORS 279C.560, if the Owner accepts bonds, securities or other instruments deposited as provided in paragraph (a) of subsection E.5.1.2, the Owner shall reduce the moneys held as retainage in an amount equal to the value of the bonds, securities and other instruments and pay the amount of the reduction to the Contractor in accordance with ORS 279C.570.

E.5.1.5 Contractor agrees that if Contractor elects to reserve retainage from any progress payment due to any Subcontractor or supplier, such retainage shall not exceed five percent of the payment, and the Contractor shall comply with all applicable legal requirements.

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

E.5.2 As provided in subsections C.2.2 and C.2.3, additional withholding in the amount of 25% of amounts earned shall be withheld and released in accordance with ORS 279C.845(7) when the Contractor fails to file certified statements as required by section C.2.1.

E.6 FINAL PAYMENT

E.6.1 Upon completion of all the Work under this Contract, the Contractor shall notify the Owner's Authorized Representative, in writing, that Contractor has completed Contractor's part of the Contract and shall request final payment. Upon receipt of such notice the Owner's Authorized Representative will inspect the Work, and if acceptable, submit to the Owner a recommendation as to acceptance of the completed Work and the final estimate of the amount due the Contractor. If the Work is not acceptable, Owner will notify Contractor within fifteen (15) Days of Contractor's request for final payment. Upon approval of this final estimate by the Owner and compliance by the Contractor with provisions in Section K.3 AFFIDAVIT/RELEASE OF LIENS AND CLAIMS, and other provisions as may be applicable, the Owner shall pay to the Contractor all monies due under the provisions of these Contract Documents.

E.6.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner’s Authorized Representative (1) a notarized affidavit/release of liens and claims in a form satisfactory to Owner that states that payrolls, bills for materials and equipment, and other

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

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

SECTION F JOB SITE CONDITIONS

F.1 USE OF PREMISES

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

F.2 PROTECTION OF WORKERS, PROPERTY, AND THE PUBLIC

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

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

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

F.2.4 Contractor is responsible for protection of adjacent work areas including impacts brought about by activities, equipment, labor, utilities, and materials on the site.

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

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

F.3 CUTTING AND PATCHING

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

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

F.4 CLEANING UP

From time to time as may be ordered by the Owner the Contractor shall, at its own expense, clean up and remove all refuse and unused materials of any kind resulting from the Work. If Contractor fails to do so within twenty-four hours after notification by the Owner the work may be done by others and the cost charged to the Contractor and deducted from payment due the Contractor.

F.5 ENVIRONMENTAL CONTAMINATION

F.5.1 Contractor will be held responsible for and shall indemnify, defend (with counsel of Owner’s choice) and hold harmless Owner from and against any costs, expenses, damages, claims, and causes of action, (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 by, the negligence or actions of Contractor or its personnel, agents, or Subcontractors or any failure to perform in accordance with the Contract Documents (except to the extent otherwise void under ORS 30.140). Nothing in this section F.5.1 shall limit Contractor's responsibility for obtaining insurance coverages

required under Section G.3 of these General Conditions, and Contractor shall take no action that would void or impair such coverages

F.5.1.1 Contractor agrees to promptly dispose of such spills, releases, discharge or leaks to the satisfaction of Owner and proper regulatory agencies in a manner that complies with applicable federal, state, and local laws and regulations. Cleanup shall be at no cost to the Owner and be performed by properly qualified personnel.

F.5.1.2 Contractor shall obtain the Owner's written consent prior to bringing onto the Work site any (i) environmental pollutants or (ii) hazardous substances or materials, as the same or reasonably similar terms are used in any applicable federal, state, or local statutes, rules or ordinances. Notwithstanding such written consent from the Owner, the Contractor, at all times, shall:

(a) properly handle, use and dispose of all environmental pollutants and hazardous substances or materials brought onto the Work site, in accordance with all applicable federal, state, or local statutes, rules, or ordinances;

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

(c) promptly clean up, without cost to the Owner, such spills, releases, discharges, or leaks to the Owner's satisfaction and in compliance with all applicable federal, state, or local statutes, rules or ordinances.

F.5.2 Contractor shall report all reportable quantity releases to applicable federal, state, and local regulatory and emergency response agencies. Reportable quantities are found in 40 CFR Part 302, Table 302.4 for hazardous substances and in OAR 340-142-0050 for all products addressed therein. Upon discovery, regardless of quantity, Contractor must telephonically report all releases to the Owner. A written follow-up report shall be submitted to Owner within 48 hours of the telephonic report. Such written report shall contain, as a minimum:

F.5.2.1 Description of items released (identity, quantity, manifest no., and all other documentation required by law.)

F.5.2.2 Whether amount of items released is EPA/DEQ reportable, and, if so, when it was reported.

F.5.2.3 Exact time and location of release, including a description of the area involved.

F.5.2.4 Containment procedures initiated.

F.5.2.5 Summary of communications about the release Contractor has had with members of the press or State officials other than Owner.

F.5.2.6 Description of cleanup procedures employed or to be employed at the site, including disposal location of spill residue.

F.5.2.7 Personnel injuries, if any, resulting from, or aggravated by, the release.

F.6 ENVIRONMENTAL CLEAN-UP

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

F.6.2 Upon being notified by Contractor of the presence of hazardous substance(s) on the project site, Owner shall arrange for the proper disposition of such hazardous substance(s).

F.7 FORCE MAJEURE

A party to this Contract shall not be held responsible for delay or default due to Force Majeure acts, events or occurrences unless they could have been avoided by the exercise of reasonable care, prudence, foresight, and diligence by that party. The Owner may terminate this Contract upon written notice after determining that delay or default caused by Force Majeure acts, events or occurrences will reasonably prevent successful performance of the Contract.

SECTION G INDEMNITY, BONDING, AND INSURANCE

G.1 RESPONSIBILITY FOR DAMAGES / INDEMNITY

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

G.1.2 Contractor agrees to indemnify, defend (with counsel approved by Owners), reimburse and hold harmless Owners, their partners, owners, board members, officers, employees, agents and volunteers (the “Indemnified Parties”) for, from and against any and all threatened, alleged or actual all claims, suits, allegations, damages, liabilities, costs, expenses, losses and judgments, including, but not limited to, those which relate to personal or real property damage (including to the Project itself or otherwise), personal injury or death, attorney and expert/consultant fees and costs, and both economic and non-economic losses, to the extent caused by the negligence, breach of contract, breach of warranty (express or implied), or other act or omission of Contractor, its employees, Agents and Subcontractors, or anyone for whose acts Contractor is responsible (the Indemnitor). If claims are asserted against any of the Indemnified Parties by an employee of the Indemnitor, the Contractor’s indemnification obligation and other obligations under this section shall not be limited by any limitation on the amount or type of damages, compensation, or benefits payable to the employee by or for the Indemnitor under workers’ compensation acts, disability benefit acts, or other employee benefit acts.

G.2 PERFORMANCE AND PAYMENT SECURITY; PUBLIC WORKS BOND

G.2.1 When the Contract Price is $100,000 or more (or $50,000 or more in the case of Contracts for highways, bridges and other transportation projects) the Contractor shall furnish and maintain in effect at all times during the Contract Period, a performance bond in a sum equal to the Contract Price, and a separate payment bond also in a sum equal to the Contract Price. The bonds may be required if the Contract Price is less than the above thresholds, if required by the Contract Documents.

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

G.2.3 Before execution of the Contract Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Laws 2005, Chapter 360, and OAR 839-025-0015, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond before permitting the Subcontractor to start Work.

G.3 INSURANCE

G.3.1 Primary Coverage: Insurance carried by Contractor under this Contract shall be the primary coverage and non-contributory with any other insurance and self- insurance, and the Owner's insurance is excess and solely for damages or losses for which the Owner is responsible. The coverages indicated are minimums unless otherwise specified in the Contract Documents.

G.3.2 Workers' Compensation: All employers, including Contractor, that employ subject workers who work under this contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer's Liability Insurance with coverage limits of not less than $100,000 for each accident. Contractors who perform the Work without the assistance or labor of any employee need not obtain such coverage if the Contractor certifies so in writing. Contractor shall ensure that each of its Subcontractors complies with these requirements. The Contractor shall require proof of such Workers' Compensation by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors.

G.3.3 Builder's Risk Insurance:

G.3.3.1 Builder's Risk: During the term of this Contract, for new construction the Contractor shall obtain and keep in effect Builder's Risk insurance on an all risk form, including earthquake and flood, for an amount equal to the full amount of the Contract. Any deductible shall not exceed $50,000 for each loss, except the earthquake and flood deductible shall not exceed 2 percent of each loss or $50,000, whichever is more. The policy will include as loss payees the Owner, the Contractor and its Subcontractors as their interests may appear.

G.3.3.2 Builder's Risk Installation Floater: For other than new construction the Contractor shall obtain and keep in effect during the term of this Contract, a Builder's Risk Installation Floater for coverage of the Contractor's labor, materials and equipment to be used for completion of the

Work performed under this Contract. The minimum amount of coverage to be carried shall be equal to the full amount of the Contract. This insurance shall include as loss payees the Owner, the Contractor and its Subcontractors as their interests may appear.

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

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

G.3.4 Liability Insurance:

G.3.4.1 Commercial General Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Commercial General Liability Insurance covering bodily injury and property damage in a form and with coverages that are satisfactory to the Owner. This insurance shall include personal injury liability, products and completed operations, and contractual liability coverage for the indemnity provided under this Contract (to the extent contractual liability coverage for the indemnity is available in the marketplace) and shall be issued on an occurrence basis. Contractor shall provide proof of insurance of not less than combined single limit, or the equivalent, of not less than: □ $200,000; □ $500,000; □ $1,000,000; □ $2,000,000 each occurrence for Bodily Injury and Property Damage. The policy, or an endorsement or amendment to the policy, must provide that the County and its agents, board members, officers, employees, and volunteers are "additional insureds", but only with respect to the Contractor's Services to be provided under this Contract.

G.3.4.2 Automobile Liability: Contractor shall obtain, at Contractor's expense, and keep in effect during the term of this Contract, Automobile Liability Insurance covering owned, non-owned and/or hired vehicles, as applicable. The coverage may be written in combination with the Commercial General Liability Insurance. Contractor shall provide proof of insurance of not less than the amounts □ Minimum amounts required by the Oregon Financial Responsibility Law (ORS 806.060 and 806.070); □ $200,000; □ $500,000; or □ $1,000,000 per occurrence, for Bodily Injury and Property Damage, including coverage for all owned, hired, or non-owned vehicles, as applicable. The policy, or an endorsement or amendment to the policy, must provide that the County and its board members, officers, agents, employees, and volunteers are "additional insureds", but only with respect to the Consultant's Services to be provided under this Contract.

G.3.4.3 "Tail" Coverage: If any of the required liability insurance is arranged on a "claims made" basis, "tail" coverage will be required at the completion of this Contract for a duration of 24 months or the maximum time period available in the marketplace if less than 24 months. Contractor will be responsible for furnishing certification of "tail" coverage as described or continuous "claims made" liability coverage for 24 months following Final Completion. Continuous "claims made" coverage will be acceptable in lieu of "tail" coverage, provided its retroactive date is on or before the effective date of this Contract. This will be a condition of the final acceptance of Work or services and related warranty (if any).

G.3.5 Excess/Umbrella Insurance: A combination of primary and excess/umbrella insurance is acceptable to meet the minimum coverage requirements for Commercial General Liability and Automobile Liability Insurance. In such case, the insurance certificate must include a list of the policies that fall under the excess/umbrella insurance. Sample wording is "The Excess/Umbrella policy is excess over primary Commercial General Liability and primary Automobile Liability Insurance."

G.3.6 Additional Insured: The liability insurance coverage, except Professional Liability if included, required for performance of this Contract shall include the Marion County, its departments, divisions, officers, and employees, as Additional Insureds but only with respect to the Contractor's activities to be performed under this Contract.

If Contractor cannot obtain an insurer to name the Marion County, its departments, divisions, officers and employees as Additional Insureds, Contractor shall obtain at Contractor's expense, and keep in effect during the term of this Contract, Owners and Contractors Protective Liability Insurance, naming the Marion County, its departments, divisions, officers and employees as Named Insureds with not less than a $1,500,000.00 limit per occurrence. This policy must be kept in effect for 12 months following Final Completion. As evidence of coverage, Contractor shall furnish the actual policy to Owner prior to execution of the Contract.

G.3.7 Certificate(s) of Insurance: As evidence of the insurance coverage required by this Contract, the Contractor shall furnish certificate(s) of insurance to the Owner prior to execution of the Contract. The certificate(s) will specify all of the parties who are Additional Insureds or Loss Payees. Insurance coverage required under this Contract shall be obtained from insurance companies or entities acceptable to the Owner that are allowed to provide such insurance under Oregon law. Eligible insurers include admitted insurers that have been issued a certificate of authority from the Oregon Department of Consumer and Business Services authorizing them to do an insurance business in the state of Oregon, and certain non-admitted surplus lines insurers that satisfy the requirements of applicable Oregon law and are approved by the Owner. The Contractor shall be financially responsible for all deductibles, self-insured retentions and/or self- insurance included hereunder. Any deductible, self- insured retention and/or self-insurance in excess of $50,000 shall be approved by the Owner in writing prior execution of the Contract and is subject to Owner's approval. The Contractor shall immediately notify the Owner's Authorized Representative in writing of any change in insurance coverage.

SECTION H SCHEDULE OF WORK

H.1 CONTRACT PERIOD

H.1.1 Time is of the essence on this Contract. The Contractor shall at all times carry on the Work diligently, without delay and punctually fulfill all requirements herein. Contractor shall commence Work on the site within fifteen (15) Days of Notice to Proceed, unless directed otherwise.

H.1.2 Unless specifically extended by Change Order, all Work shall be complete by the date contained in the Contract Documents. The Owner shall have the right to accelerate the completion date of the Work, which may require the use of overtime. Such accelerated Work schedule shall be an acceleration in performance of Work under Section D.1.2.6 and shall be subject to the Change Order process of Section D.1.

H.1.3 The Owner shall not waive any rights under the Contract by permitting the Contractor to continue or complete in whole or in part the Work after the date described in Section H.1.2 above.

H.2 SCHEDULE

Contractor shall provide, by or before the pre- construction conference, a detailed schedule for review and acceptance by the Owner. The submitted schedule must illustrate Work by significant project components, significant labor trades, long lead items, broken down by building and/or floor where applicable. Each schedule item shall account for no greater than 5 % of the monetary value of the project or 5 % of the available Contract Time. Schedules with activities of less than one day or valued at less than 1% of the Contract will be considered too detailed and will not be accepted. Schedules lacking adequate detail, or unreasonably detailed, will be rejected. Included within the schedule are the following: Notice to Proceed, Substantial Completion, and Final Completion. Schedules will be updated monthly and submitted with the monthly payment application. Acceptance of the Schedule by the Owner does not constitute agreement by the Owner, as to the Contractor's sequencing, means, methods, or allocated Contract Time. Any positive difference between the Contractor's scheduled completion and the Contract completion date is float owned by the Owner. Owner reserves the right to negotiate the float if it is deemed to be in Owner’s best interest to do so. In no case shall the Contractor make a request for additional compensation for delays if the Work is completed within the Contract Time but after Contractor's scheduled completion.

H.3 PARTIAL OCCUPANCY OR USE

The Owner may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have reasonably accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, insurance or self-insurance, maintenance, heat, utilities, and damage to the Work, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents with respect to such portion of the Work. Approval by the Contractor to partial occupancy or use shall not be unreasonably withheld. Immediately prior to such partial occupancy or use, the Owner and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

SECTION I CORRECTION OF WORK

I.1 CORRECTION OF WORK BEFORE FINAL PAYMENT

The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects, and that the Work will conform to the requirements of the Contract Documents. Work failing to conform to these requirements shall be deemed defective. Contractor shall promptly remove from the premises and replace all defective materials and equipment as determined by the Owner's Authorized Representative, whether incorporated in the Work or not. Removal and replacement shall be without loss or expense to the Owner, and Contractor shall bear the cost of repairing all Work destroyed or damaged by such removal or replacement. Contractor shall be allowed a period of no longer than thirty (30) Days after Substantial Completion for completion of defective (punch list) work, unless otherwise agreed. At the end of that period, or earlier if requested by the Contractor, Owner

shall arrange for inspection of the Work by the Architect/Engineer. Should the Work not be complete, and all corrections made, the costs for all subsequent re-inspections shall be borne by the Contractor. If Contractor fails to complete the punch list work within the above time period, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) days after demand without affecting Contractor's obligations.

I.2 WARRANTY WORK

I.2.1 Neither the final certificate of payment nor any provision of the Contract Documents shall relieve the Contractor from responsibility for defective Work and, unless a longer period is specified, Contractor shall correct all defects that appear in the Work within a period of one year from the date of issuance of the written notice of Substantial Completion by the Owner except for latent defects which will be remedied by the Contractor at any time they become apparent.

I.2.2 The Owner shall give Contractor notice of defects with reasonable promptness. Contractor shall perform such warranty work within a reasonable time after Owner's demand. If Contractor fails to complete the warranty work within such period as Owner determines reasonable, or at any time in the event of warranty work consisting of emergency repairs, Owner may perform such work and Contractor shall reimburse Owner all costs of the same within ten (10) Days after demand without affecting Contractor's obligations.

I.2.3 This provision does not negate guarantees or warranties for periods longer than one year including without limitation such guarantees or warranties required by other sections of the Contract Documents for specific installations, materials, processes, equipment or fixtures.

I.2.4 In addition to Contractor's warranty, manufacturer's warranties shall pass to the Owner and shall not take effect until affected Work has been accepted in writing by the Owner's Authorized Representative.

I.2.5 The one-year period for correction of Work shall be extended with respect to portions of Work performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work and shall be extended by corrective Work performed by the Contractor pursuant to this Section, as to the Work corrected. The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

I.2.6 Nothing contained in this Section I.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the period for correction of Work as described in this Section I.2 relates only to the specific obligation of the Contractor to correct the Work and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

I.2.7 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Price will be reduced as appropriate and equitable. Such adjustment shall be affected whether or not final payment has been made.

SECTION J SUSPENSION AND/OR TERMINATION OF THE WORK

J.1 OWNER'S RIGHT TO SUSPEND THE WORK

J.1.1 The Owner and/or the Owner's Authorized Representative has the authority to suspend portions or all of the Work due to the following causes:

J.1.1.1 Failure of the Contractor to correct unsafe conditions;

J.1.1.2 Failure of the Contractor to carry out any provision of the Contract;

J.1.1.3 Failure of the Contractor to carry out orders;

J.1.1.4 Conditions, in the opinion of the Owner's Authorized Representative, which are unsuitable for performing the Work;

J.1.1.5 Time required to investigate differing site conditions;

J.1.1.6 Any reason considered to be in the public interest.

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

J.2 CONTRACTOR'S RESPONSIBILITIES

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

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

J.3 COMPENSATION FOR SUSPENSION

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

J.4 OWNER'S RIGHT TO TERMINATE CONTRACT

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

J.4.1.1 If Contractor should voluntarily or involuntarily, seek protection under the United States Bankruptcy Code and Contractor as debtor-in- possession or the Trustee for the estate fails to assume the Contract within a reasonable time;

J.4.1.2 If Contractor should make a general assignment for the benefit of Contractor's creditors;

J.4.1.3 If a receiver should be appointed on account of Contractor's insolvency;

J.4.1.4 If Contractor should repeatedly refuse or fail to supply an adequate number of skilled workers or proper materials to carry on the Work as required by the Contract Documents, or otherwise fail to perform the Work in a timely manner;

J.4.1.5 If Contractor should repeatedly fail to make prompt payment to Subcontractors or for material or labor, or should disregard laws, ordinances or the instructions of the Owner or its Authorized Representative; or

J.4.1.6 If Contractor is otherwise in material breach of any part of the Contract.

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

J.5 TERMINATION FOR CONVENIENCE

J.5.1 Owner may terminate the Contract in whole or in part whenever Owner determines that termination of the Contract is in the best interest of the public.

J.5.2 The Owner will provide the Contractor with seven (7) Days' prior written notice of a termination for public convenience. After such notice, the Contractor shall provide the Owner with immediate and peaceful possession of the premises and materials located on and off the premises for which the Contractor received progress payment under Section E. Compensation for Work terminated by the Owner under this provision will be according to Section E. In no circumstance shall Contractor be entitled to lost profits for Work not performed due to termination.

J.6 ACTION UPON TERMINATION

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

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

SECTION K CONTRACT CLOSE OUT

K.1 RECORD DOCUMENTS

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

K.2 OPERATION AND MAINTENANCE MANUALS

As part of the Work, Contractor shall submit two completed operation and maintenance manuals ("O & M Manuals") and one (1) digital copy for review by the Owner's Authorized Representative prior to submission of any pay request for more than 75% of the Work. No payments beyond 75% will be made by the Owner until the 0 & M Manuals have been received. The O & M Manuals shall contain training information, phone list of consultants, manufacturers, installer and suppliers, manufacturer's printed data, schematic diagrams of systems, appropriate equipment indices, warranties and bonds. The Owner's Authorized Representative shall review and return one O & M Manual for any modifications or additions required. Prior to submission of its final pay request, Contractor shall deliver three (3) complete and approved sets and one (1) digital copy of O & M Manuals to the Owner's Authorized Representative.

K.3 AFFIDAVIT/RELEASE OF LIENS AND CLAIMS

As a condition of final payment, the Contractor shall submit to the Owner's Authorized Representative a notarized affidavit/release of liens and claims form, in a form satisfactory to Owner, which states that all Subcontractors and suppliers have been paid in full, all disputes with property owners have been resolved, all obligations on the project have been satisfied, all monetary claims and indebtedness have been paid, and that, to the best of the Contractor's knowledge, there are no claims of any kind outstanding against the project. The Contractor shall indemnify, defend (with counsel of Owner's choice) and hold harmless the Owner from all claims for labor and materials finished under this Contract. The Contractor shall furnish complete and valid releases or waivers, satisfactory to the Owner, of all liens arising out of or filed in connection with the Work.

K.4 COMPLETION NOTICES

K.4.1 Contractor shall provide Owner’s Authorized Representative notice of both Substantial and Final Completion. The certificate of Substantial Completion shall state the date of Substantial Completion, the responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and the time within which the Contractor shall finish all items on the punchlist accompanying the Certificate. Both completion notices must be signed by the Contractor and the Owner to be valid. The Owner shall provide the final signature on the notices. The notices shall take effect on the date they are signed by the Owner.

K.4.2 Substantial Completion of a facility with operating systems (e.g., mechanical, electrical, HVAC) shall be that degree of completion that has provided a minimum of thirty (30) continuous Days of successful, trouble-free operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the Owner's Authorized Representative. All equipment contained in the Work, plus all other components necessary to enable the Owner to operate the facility in the manner that was intended, shall be complete on the Substantial Completion date. The

Contractor may request that a punch list be prepared by the Owner's Authorized Representative with submission of the request for the Substantial Completion notice.

K.5 TRAINING

As part of the Work, and prior to submission of the request for final payment, the Contractor shall schedule with the Owner's Authorized Representative, training sessions for all equipment and systems, as required in the individual specifications sections. Contractor shall schedule training sessions at least four weeks in advance of the date of training to allow Owner personnel adequate notice. The O & M Manual shall be used as a basis for training. Training shall be a formal session, held after the equipment and/or system is completely installed and operational in its normal operating environment.

K.6 EXTRA MATERIALS

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

K.7 ENVIRONMENTAL CLEAN-UP

As part of the Final Completion notice, or as a separate written notice submitted with or before the notice of Final Completion, the Contractor shall notify the Owner that all environmental pollution clean-up performed as a part of this Contract has been disposed of in accordance with all applicable rules, regulations, laws, and statutes of all agencies having jurisdiction over such environmental pollution. The notice shall reaffirm the indemnification given under Section F.5.1 above.

K.8 CERTIFICATE OF OCCUPANCY

The Contractor shall not be granted Final Completion or receive final payment if the Owner has not received an unconditioned certificate of occupancy from the appropriate state and/or local building officials, unless failure to obtain an unconditional certificate of occupancy is due to the fault or neglect of Owner.

K.9 OTHER CONTRACTOR RESPONSIBILITIES

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

K.10 SURVIVAL

All warranty and indemnification provisions of this Contract, and all of Contractor’s other obligations under this Contract that are not fully performed by the time of Final Completion or termination, shall survive Final Completion or any termination of the Contract

SECTION L LEGAL RELATIONS & RESPONSIBILITIES

L.1 LAWS TO BE OBSERVED

In compliance with ORS 279C.525, Sections L.2 through L.4 contain lists of federal, state, and local agencies of which the Owner has knowledge that have enacted ordinances or regulations relating to

environmental pollution and the preservation of natural resources that may affect the performance of the Contract:

L.2 FEDERAL AGENCIES

Agriculture, Department of
Forest Service
Soil Conservation Service
Coast Guard
Defense, Department of
Army Corps of Engineers
Energy, Department of
Federal Energy Regulatory Commission
Environmental Protection Agency
Health and Human Services
Department of Housing and Urban Development
Department of Solar Energy and Energy Conservation Bank
Interior, Department of
Bureau of Land Management
Bureau of Indian Affairs
Bureau of Mines
Bureau of Reclamation
Geological Survey
Minerals Management Service
U.S. Fish and Wildlife Service
Labor, Department of
Mine Safety and Health Administration
Occupation Safety and Health Administration
Transportation, Department of
Federal Highway Administration
Water Resources Council

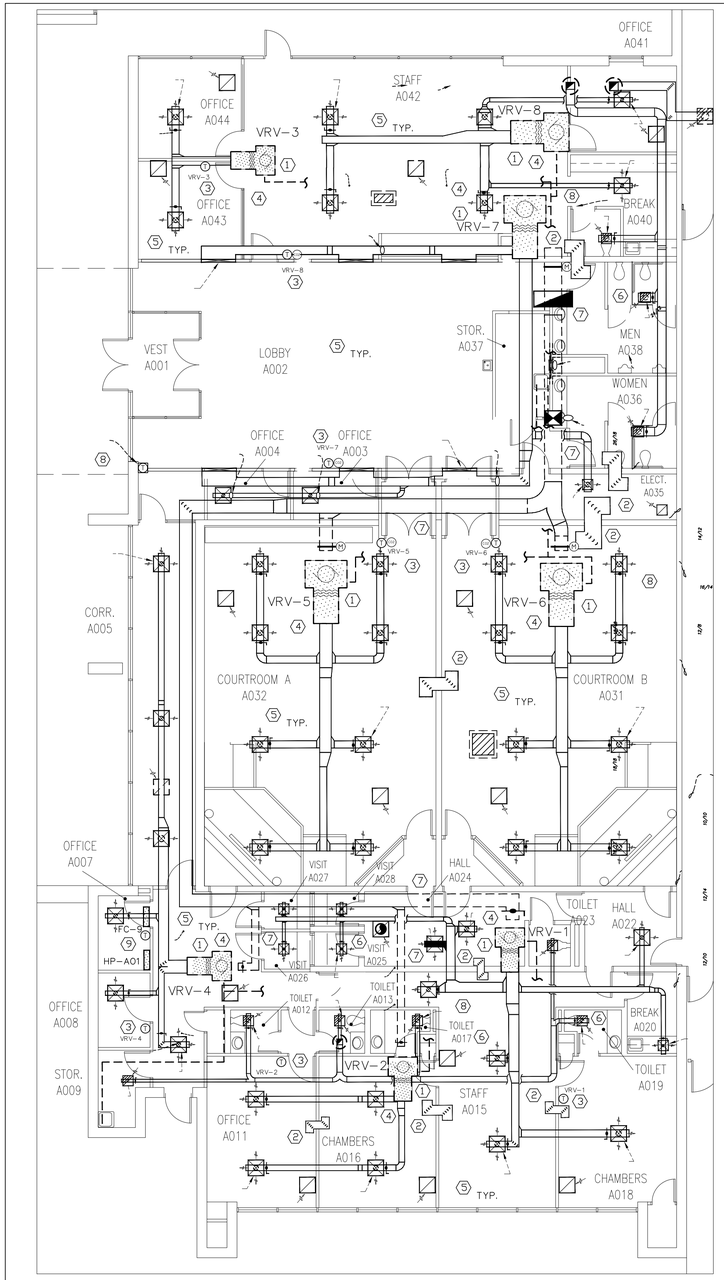
L.3 STATE AGENCIES

Administrative Services, Department of
Agriculture, Department of
Soil and Water Conservation Commission
Columbia River Gorge Commission
Energy, Department of
Environmental Quality, Department of
Fish and Wildlife, Department of
Forestry, Department of
Geology and Mineral Industries, Department of
Human Resources, Department of
Consumer and Business Services, Department of
Land Conservation and Development Commission
Parks and Recreation, Department of
State Lands, Division of
Water Resources Department of

L.4 LOCAL AGENCIES

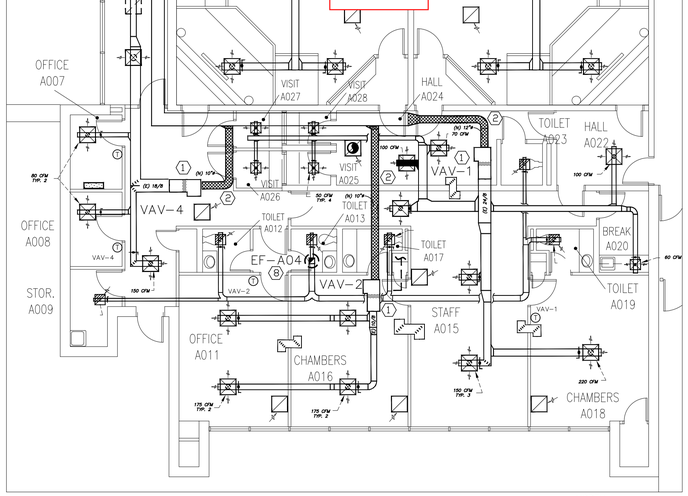
City Councils
County Courts
County Commissioner, Board of
Design Commissions
Historical Preservation Commission
Planning Commissions

Attachment 1



1 PARTIAL FIRST FLOOR DEMOLITION PLAN

SCALE: 1/8" = 1'-0"



2 PARTIAL FIRST FLOOR PLAN

SCALE: 1/8" = 1'-0"

NORTH

KEYPLAN

DUCT LEGEND

- EXISTING DUCT TO BE REMOVED
- EXISTING DUCT TO REMAIN
- NEW DUCT

NOTE: PROVIDE TURNING VANES IN RECTANGLE DUCT ELBOWS

1/M1 NOTES

1. REMOVE EXISTING VRF BOX, ASSOCIATED REFRIGERANT PIPING, CONDENSATE DRAIN AND HOT WATER COIL DOWNSTREAM DUCT WORK TO BE REUSED SEE 2/M1.
2. EXISTING TRANSFER GRILLES, DUCTS AND RELIEFS TO REMAIN, VERIFY CORRECT OPERATION, EXERCISE ANY DAMPERS.
3. CONTRACTOR TO REMOVE ALL EXISTING ABANDONED THERMOSTATS, PREPARE LOCATION OF EXISTING LG THERMOSTAT FOR NEW AUTOMATED LOGIC THERMOSTAT PER SPECIFICATIONS.
4. COORDINATE WITH CONTROLS CONTRACTOR PRIOR TO REMOVAL OF EXISTING CIRCUITS.
5. EXISTING DIFFUSERS REMAIN, BALANCE PER 2/M1 AND SPECIFICATIONS.
6. EXISTING EXHAUST SYSTEM REMAINS, VERIFY EXISTING CFM DURING BALANCING.
7. REMOVE EXISTING SUPPLY DUCT, AS SHOWN, PREPARE SPACE FOR NEW SUPPLY DUCT PER 2/M1.
8. CONTRACTOR TO REMOVE EXISTING LG VRF HRU BOX AND ASSOCIATED REFRIGERANT PIPING, CONTROLS AND CIRCUITING.
9. CONTRACTOR TO REMOVE EXISTING LG DUCTLESS UNIT (FC9), FUJITSU DUCTLESS (HP-A01) TO REMAIN.

2/M1 NOTES

1. INSTALL NEW VAV BOX PER SCHEDULE, INSTALL PER MANUFACTURER, PROVIDE NEW FLEX CONNECTIONS TO HYDRONIC COIL, NEW BALANCE VALVE, CHECK VALVE, Y STRAINER WITH DRAIN VALVE AND HOSE CONNECTION AND CAP, PROVIDE OFFSETS AND TRANSITIONS AS REQUIRED TO CONNECT TO SUPPLY DUCT WITH NEW DUCT AS SHOWN. PROVIDE NEW CONTROLS PER SPECIFICATIONS AND MANUFACTURER.
2. INSTALL NEW SUPPLY DUCT PER PLAN AND SPECIFICATIONS. TRANSITION UP TO EXISTING DROP.
3. VERIFY FIRE DAMPERS ARE OPEN PRIOR TO BALANCING OF SYSTEM, NOTE: NOT ALL DAMPERS MAY BE SHOWN.
4. CONTRACTOR TO PROVIDE MOTORIZED DAMPER ON EXISTING 30x30" RELIEF DUCT, REMOVE EXISTING BAROMETRIC DAMPER, SET OPERATION TO WORK WITH ECONOMIZER OF AHU-1.
5. DO NOT INSULATE DUCT AT WALL PENETRATION, SEAL ENDS OF INSULATION ON EITHER SIDE PER MANUFACTURER.
6. CONTRACTOR TO REMOVE/CUT BLOCK AS NEEDED TO FIT NEW DUCT THROUGH WALL.
7. CONTRACTOR TO PROVIDE MOTORIZED DAMPER ON EXISTING 26x12" RELIEF DUCT, PROVIDE CONTROL CONNECTION TO AUTOMATED LOGIC (ALC) DDC SYSTEM, SET OPERATION TO WORK WITH ECONOMIZER OF AHU-1.
8. CONTRACTOR TO PROVIDE CONTROLS FOR EF AND SVF FANS WITH ALC, RELAYS LOCATED IN ELECTRIC ROOM A035, ASVFCP PANEL. DETAIL SHEET 3/M2.

GENERAL NOTES:

1. CONTRACTOR RESPONSIBLE FOR THE REMOVAL AND REPLACEMENT OF ALL CEILINGS REQUIRED TO PERFORM WORK DESCRIBED.
2. CONTRACTOR RESPONSIBLE FOR THE REMOVAL AND REPLACEMENT OF FIRE SPRINKLER PIPING REQUIRED TO BE REMOVED AND REPLACED OR RELOCATED IN ORDER TO PERFORM WORK, NOTE FIRE SPRINKLER RUNS NEAR SEVERAL UNITS; VAV-07 AND 08 FOR EXAMPLE.
3. CONTRACTOR RESPONSIBLE FOR ALL WORK DESCRIBED IN SPECIFICATIONS, SCHEDULES AND DRAWINGS. CONTRACTOR TO PROVIDE ALL NECESSARY COMPONENTS FOR A COMPLETE AND OPERABLE SYSTEM, MEETING ALL LOCAL CODES AND MANUFACTURER'S INSTALLATION REQUIREMENTS.
4. CONTRACTOR TO PROVIDE AHU-1 PER SCHEDULE, CONTRACTOR TO BREAK DOWN AHU-1 ONSITE TO TRANSPORT THROUGH BUILDING OR GO THROUGH LOUVER OPENING, REBUILD UNIT IN MECHANICAL ROOM, AHU FACTORY REPRESENTATIVE TO BE PRESENT WHEN UNIT IS DISASSEMBLED AND REASSEMBLED.
5. CONTRACTOR TO INSTALL AHU-1 PER PLANS. PROVIDE NEW DUCT STATIC PRESSURE SENSOR TO MODULATE FAN VFD SPEED BASED ON DUCT STATIC. UJTILIZE CO2 SENSORS IN COURTROOM A, COURTROOM B, LOBBY AND STAFF A042. MODULATE MOTORIZED DAMPER IN OSA SUPPLY DUCT, MODULATE DAMPERS TO MAINTAIN 800PPM (ADJ) CO2 IN SPACE AND BUILDING PRESSURE.
6. CONTRACTOR RESPONSIBLE FOR THE MODIFICATION OF THE EXISTING HOT WATER PIPING, VALVES AND CONTROLS. CONTRACTOR TO EXTEND TO NEW VAV BOX LOCATION, CONTRACTOR RESPONSIBLE FOR FLUSHING NEW PORTIONS OF PIPING, AND PREVENTING DEBRIS FROM ENTERING SYSTEM.
7. ALL WORK MUST BE DONE DURING NON-BUSINESS HOURS, NO WORK MONDAY-FRIDAY FROM 8:00AM TO 5:00 PM, EXCEPT FOR COURT HOLIDAYS.
8. ALL AREAS MUST BE READY FOR BUSINESS AFTER EACH SHIFT. ALL CEILING TILES EXCEPT FOR OFFICE AREAS MUST BE IN PLACE BEFORE 8:00AM.
9. CONTRACTOR RESPONSIBLE FOR REPLACEMENT OF ALL DAMAGED OR MARRED CEILING TILES, ARMSTRONG #584 CEILING TILE.
10. CONTRACTOR TO PAINT ALL REPAIRED SURFACES AND IN SURFACES DAMAGED DURING THE COURSE OF WORK, PAINT COLORS ARE SHERWIN-WILLIAMS SC-23-03 COTTAGE WHITE AND SC 23-04 DENIM.
11. ALL CRANE WORK TO BE PERFORMED WHEN BUILDING IS UNOCCUPIED, AFTER BUSINESS HOURS, WEEKENDS OR COURT HOLIDAYS.
12. ALL ONSITE CONTRACTORS MUST COMPLETE AND PASS A MARION COUNTY BACK GROUND CHECK PRIOR TO BEING ONSITE.
13. ALL REFRIGERANT PIPING CONNECTIONS MUST BE BRAZED, NO QUICK CONNECT, CRIMP METHODS OR MECHANICAL SEALS.
14. NEW FAN POWERED VAV BOXES TO HAVE SPRING ISOLATION BETWEEN UNIT AND STRUCTURE.
15. AIR HANDLING UNIT, FAN POWERED VAV BOXES AND CONDENSING UNIT TO HAVE TERMINAL STRIPS FOR AUTOMATED LOGIC CONTROLS, NO BACNET INTERFACE INTEGRATION ALLOWED, ALL EQUIPMENT PROVIDED TO WORK DIRECTLY WITH ALC CONTROLS. EQUIPMENT SUBMITTALS TO BE REVIEWED AND APPROVED BY CLIMATECH PRIOR TO ORDERING EQUIPMENT.
16. ALL AREAS OF WORK EXPOSED TO BUILDING OCCUPANTS SHALL BE ISOLATED WITH PLASTIC SHEATHING TO PREVENT OCCUPANT EXPOSURE TO DUST AND DEBRIS. ALL AREAS OF WORK ARE TO BE CLEANED PRIOR TO END OF SHIFT. RESTROOM CEILINGS TO BE SEALED WITH PLASTIC SHEATHING AT THE END OF EACH SHIFT TO PREVENT OCCUPANT ACCESS ABOVE CEILING.
17. CONTRACTOR TO DEMO EXISTING PNEUMATIC CONTROLS, SERVING HALL CONVECTORS AND HEATING COILS. COORDINATE REMOVAL OF PNEUMATICS WITH OWNER'S REPRESENTATIVE PRIOR TO ANY DEMOLITION.
18. CONTRACTOR TO COORDINATE WITH CLIMATECH TO HAVE CONTROLS ON FAN POWERED VAV BOXES PRIOR TO INSTALLATION OF VAV BOXES. EACH AREA TO HAVE AIR CIRCULATION AND HEAT PRIOR TO END OF SHIFT.
19. CONTRACTOR TO COORDINATE WITH CLIMATECH TO HAVE CONTROL CABINETS IN PLACE AND COMMUNICATION WIRING COMPLETED PRIOR TO DEMOLITION OF EXISTING SYSTEMS.
20. CONTRACTOR TO PROVIDE THIRD PARTY BALANCING OF SYSTEM PER SPECIFICATIONS AND DRAWINGS.
21. ALL ROOF WORK TO MEET ROOFING MANUFACTURER'S INSTALLATION REQUIREMENTS, CONTRACTOR TO USE TORCHED DOWN PATCHING NO WET PATCH TYPE SEALANT ACCEPTABLE.
22. CONTRACTOR RESPONSIBLE FOR PROVIDING SEISMIC SUPPORTS, DESIGNED BY AN OREGON LICENSED STRUCTURAL ENGINEER.
23. CONTRACTOR TO PRESSURE TEST NEW AND EXISTING DUCT FROM AHU TO FAN POWERED VAV BOXES, PER SPECIFICATIONS.
24. CONTRACTORS ARE NOT ALLOWED TO WHERE ORANGE COLORED CLOTHING ANYWHERE ON THE FACILITY GROUNDS.
25. NO TOBACCO USAGE ON MARION COUNTY PROPERTY, INCLUDING VAPING, CONTRACTORS MUST GO TO PUBLIC STREET FOR USE.
26. CONTRACTOR TO REMOVE EXISTING LG VRF SYSTEM AND SYSTEM COMPONENTS UNLESS OTHERWISE NOTED. ALL EQUIPMENT AND REFRIGERANT TO BE PROPERLY DISPOSED OF OFFSITE.
27. ALL EXTERIOR EQUIPMENT SUPPORTS AND RAILS TO BE WELDED WITH DIPPED GALVANIZING, ALL BRACKETS AND BOLTS TO BE GALVANIZED. CONTRACTOR TO SPRAY GALVANIZE ANY RAW EDGES CAUSED BY DRILLING OR CUTTING.
28. BOTTOM OF NEW VAV BOXES TO BE NO MORE THAN 18" ABOVE CEILING, VALVES TO BE NO MORE THAN 24" ABOVE CEILING, AND ELECTRICAL DISCONNECTS TO BE NO MORE THAN 24" ABOVE CEILING.

Designed DB
Drawn DB
Checked DB

DECEMBER 2023

MARION COUNTY COURT ANNEX
HVAC RENOVATION PROJECT
4000 AUMSVILLE HWY. SALEM OREGON

REGISTERED PROFESSIONAL ENGINEER
61436PE
OREGON
JUNE 7, 2012
DAVID CHARLES BACHMEIER
EXPIRES: 12/31/2025

CBD ENGINEERING, LLC
35468 RIVERSIDE DR. SW
ALBANY, OREGON 97321
(541) 619-7287

REVISIONS

Date	Description	Approved

File No. M1.DWG

Drawing No. M1

Sheet 1 of 3

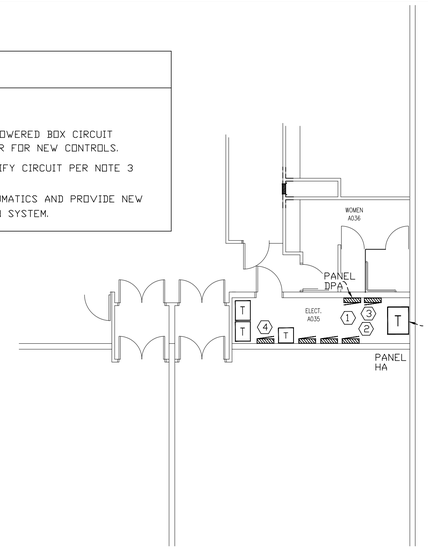
OSA CALCULATION

ZONE	UNIT	ZONE AREA	OCC. DENSITY	# OF PERSONS	PEOPLE OUTDOOR AIRFLOW RATE	AREA OUTDOOR AIRFLOW RATE	BREATHING ZONE OUTDOOR AIRFLOW	ZONE EFF. (EZ)	(VOT) OSA
STAFF/CHAMBERS	VAV-1	1300	5	7	5	0.06	111	1	111
OFFICE/CHAMBERS	VAV-2	600	5	3	5	0.06	51	1	51
OFFICES	VAV-3	315	5	2	5	0.06	27	1	27
OFFICES	VAV-4	700	5	4	5	0.06	60	1	60
COURT ROOM A	VAV-5	1200	70	84	5	0.06	492	1	492
COURT ROOM B	VAV-6	1200	70	84	5	0.06	492	1	492
LOBBY A002	VAV-7	1400	10	14	5	0.06	154	1	154
STAFF A042	VAV-8	1200	5	6	5	0.06	102	1	102

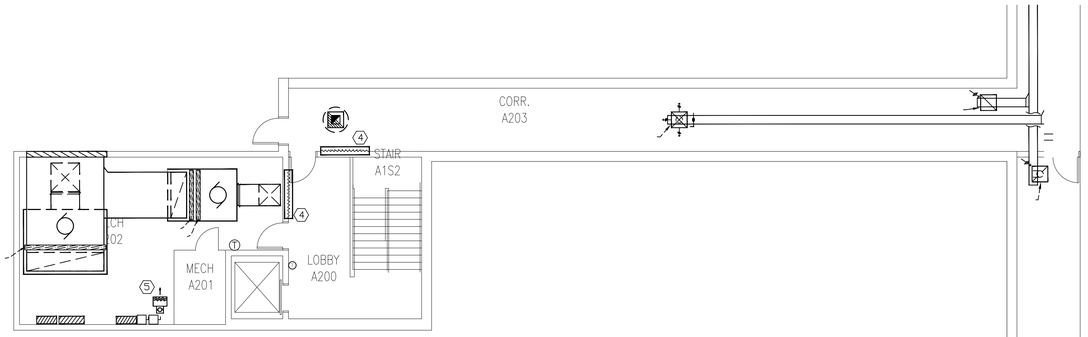
VAV-5 250 CFM MINIMUM BASED ON 1/2 OCCUPANCY AND CO2 CONTROL FOR OSA TO MAINTAIN 800PPM CO2.
VAV-6 250 CFM MINIMUM BASED ON 1/2 OCCUPANCY AND CO2 CONTROL FOR OSA TO MAINTAIN 800PPM CO2.

3/M2 NOTES

1. EXISTING CONDENSING UNIT SERVED BY PANEL DPA BREAKER 1,3,5.
2. EXISTING VRV BOXES SERVED BY PANEL HA2, DISCONNECT CONDUIT SERVING EACH FAN POWERED BOX CIRCUIT FROM PANEL HA2, TYPICAL 4 CIRCUITS, MODIFY CIRCUITS AS REQUIRED TO PROVIDE POWER FOR NEW CONTROLS.
3. EXISTING AIR HANDLING UNIT SERVED BY PANEL DPA BREAKER 2,4,6. CONTRACTOR TO MODIFY CIRCUIT PER NOTE 3 DETAIL 2/M2.
4. EXISTING ASVRCP RELAY PANEL FOR EF-A03, EF-A04, SVF-01 AND SVF-02, REMOVE PNEUMATICS AND PROVIDE NEW ALC CONTROL RELAYS. MAINTAIN EXISTING SEQUENCE OF OPERATION, PROVIDE GRAPHICS IN SYSTEM.

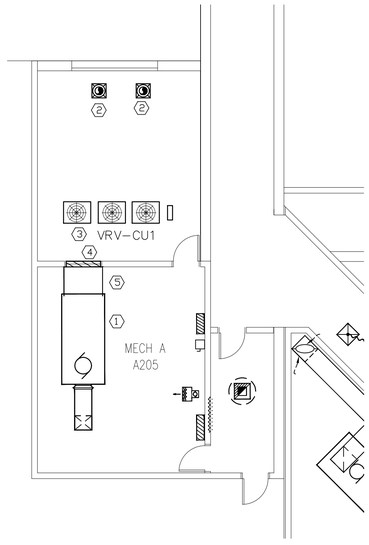


3 PARTIAL ELECTRICAL ROOM PLAN
SCALE: 1/4" = 1'-0"

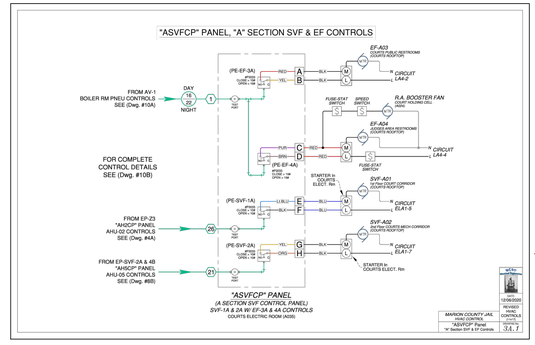


2/M2 NOTES

1. INSTALL NEW CONDENSING UNIT PER MANUFACTURER, MOUNT ON MASON INDUSTRIES OR APPROVED, SPRING ISOLATION RAILS, PROVIDE NEW CAPS ON ROOF CURBS. PROVIDE NEW 460V/3PH 70 AMP DISCONNECT, FEED FROM EXISTING. 460V/3PH/80A BREAKER IN PANEL DPA. ALL SUPPORTS TO BE DIPPED GALVANIZED, BRACKETS AND BOLTS TO BE GALVANIZED. SPRAY GALVANIZE ANY RAW METAL EDGES FROM CUTTING OR DRILLING.
2. ROUTE NEW REFRIGERANT PIPING INTO MECHANICAL ROOM, UTILIZE EXISTING PENETRATIONS WHERE POSSIBLE, PATCH ANY ABANDONED PENETRATIONS TO MATCH ADJACENT. CONTINUE TO NEW AIR HANDLING UNIT.
3. CONTRACTOR TO PROVIDE NEW AIR HANDLING UNIT PER SCHEDULE, CONTRACTOR TO FIELD VERIFY DIMENSIONS OF PENETRATIONS PRIOR TO ORDERING EQUIPMENT. PROVIDE DSA AND RELIEF DUCTS TO EXTERIOR WALL PER DETAIL M3. PROVIDE 3/4" HWS AND HWR PIPING FROM EAST WALL TO UNIT CONNECTION, TRANSITION TO 2" COIL CONNECTION AT AT UNIT. CONTRACTOR TO PROVIDE (2) CIRCUITS TO AIR HANDLER PER SCHEDULE, CONTRACTOR TO PROVIDE 120 VOLT 20 AMP CIRCUIT FROM PANEL LA4 ON FIRST FLOOR, CIRCUIT 52. CONTRACTOR TO MODIFY CIRCUIT DPA 2,4,6 TO 460 VOLT 45 AMP, 1.25" CONDUIT (4) #6 THHN CU, (1) #8 THHN CU GROUND. ROUTE CONDENSATE DRAIN TO FLOOR DRAIN.
4. CONTRACTOR TO PROVIDE NEW 1/2" HEATING CONTROL VALVE, CONNECT THROUGH EXISTING ALC BUILDING CONTROL SYSTEM. PROVIDE AREA TEMPERATURE SENSOR CONCEALED IN INSULATED WALL BOX, COORDINATE LOCATION WITH OWNER PRIOR TO ROUGH IN.
5. CONTRACTOR TO PROVIDE NEW ROOM SENSOR CONNECT THROUGH EXISTING ALC BUILDING CONTROL SENSOR TO CONTROL UNIT HEATER FAN TO CONTROL ROOM TEMPERATURE SET POINT. LOCATE ROOM SENSOR IN EXISTING LOCATION.
6. CONTRACTOR TO REINSTALL EXISTING LOUVER AFTER AHU SECTIONS ARE INSTALLED. CONTRACTOR TO SEAL LOUVER PER MANUFACTURER, CONTRACTOR TO PROVIDE NEW OPENING ABOVE EXISTING LOUVER FOR 40"x24" RELIEF DUCT. SEE DETAIL M3 FOR ELEVATION. CONTRACTOR TO TRANSITION FROM DSA UNIT CONNECTION TO 48"x22" DSA DUCT, CONTINUE DUCT TO EXTERIOR WALL, INSTALL FILTER RACK IN ACCESSIBLE LOCATION WITH WIRE MESH PRE-FILTERS IN DSA DUCT PROVIDE BACK BOX AT LOUVER. CONTRACTOR TO TRANSITION FROM AHU RELIEF CONNECTION TO 40"x24" RELIEF DUCT, EXTEND TO EXTERIOR WALL, PENETRATE WALL ABOVE LOUVER WITH STAINLESS STEEL DUCT, EXTEND SS DUCT UP EXTERIOR WALL, CONTINUE ABOVE MECHANICAL ROOM ROOF, ELBOW ABOVE MECHANICAL ROOM ROOF AND TERMINATE WITH A 135 DEGREE GOOSENECK WITH BIRD SCREEN.
7. FIRE SEAL EXISTING REFRIGERANT LINE CORE HOLES THROUGH CONCRETE, COVER WITH 16 GAUGE METAL.

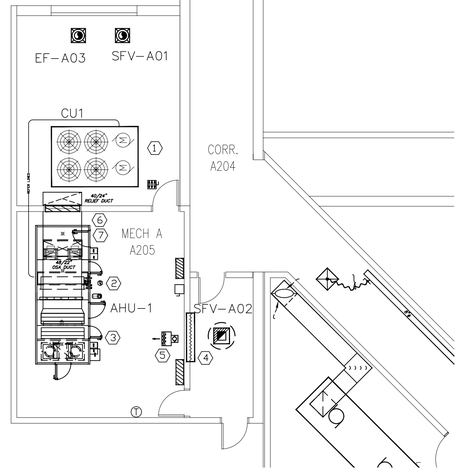


1 PARTIAL SECOND FLOOR DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

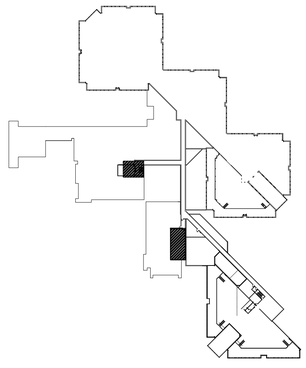


1/M2 NOTES

1. REMOVE EXISTING AIR HANDLER, RETURN MOTOR AND VFD TO OWNER.
2. EXISTING EXHAUST FAN, PROVIDE NEW CONTROLS PER NOTES THIS SHEET.
3. REMOVE EXISTING CONDENSING UNITS, PREPARE CURBS FOR A NEW RAIL SYSTEM TO SUPPORT NEW CONDENSING UNITS PER MANUFACTURER. PROVIDE LICENSED OREGON ENGINEER STRUCTURAL DESIGN FOR SUPPORT AND SEISMIC. DISCONNECT EXISTING ELECTRICAL, PROVIDE NEW ELECTRICAL COMPONENTS PER 2/M2.
4. CONTRACTOR TO REMOVE EXISTING WALL LOUVER TO INSTALL AIR HANDLER SECTIONS, CONTRACTOR RESPONSIBLE TO RELOCATE/REMOVE EXISTING CONDUITS IN ORDER TO REMOVE LOUVER AND INSTALL RELIEF DUCT.
5. CONTRACTOR TO REMOVE EXISTING REFRIGERANT PIPING SERVING THE LG VRF SYSTEM, DRAW DOWN AND DISPOSE OF REFRIGERANT PER CURRENT REGULATIONS.



2 PARTIAL SECOND FLOOR PLAN
SCALE: 1/8" = 1'-0"



KEYPLAN

Designed DB
Drawn DB
Checked DB

JULY 2014

MARION COUNTY COURT ANNEX
HVAC RENOVATION PROJECT
4000 AUMSVILLE HWY. SALEM OREGON

REGISTERED PROFESSIONAL ENGINEER
61436PE
OREGON
JUNE 7, 2013
DAVID CHARLES BACHMEIER
EXPIRES: 12/31/2025

CBD ENGINEERING, LLC
35468 RIVERSIDE DR. SW
ALBANY, OREGON 97321
(541) 619-7287

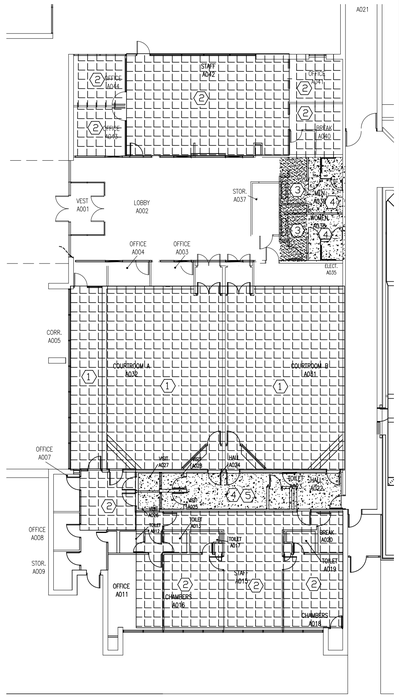
REVISIONS

Date	Description	Approved

File No. M2.DWG

Drawing No. M2

Sheet 2 of 3



14/M3 NOTES

1. CONTRACTOR TO REMOVE CEILING TILES IN THIS AREA AS REQUIRED TO PERFORM WORK, CEILING TO BE IN PLACE AT THE BEING OF BUSINESS EVERY DAY.
2. CONTRACTOR TO REMOVE CEILING TILES IN THIS AREA AS REQUIRED TO PERFORM WORK, CEILING TILES CAN BE LEFT OUT THROUGH THE COURSE OF THE PROJECT, CONTRACTOR RESPONSIBLE FOR STORAGE OF CEILING TILES.
3. CONTRACTOR TO REMOVE THIS SECTION OF THE HARD LID CEILING TO PERFORM WORK. BLACK PLASTIC SHEATHING TO BE USED TO SEPARATE INTERSTITIAL SPACE FROM RESTROOM DURING BUSINESS HOURS. CONTRACTOR TO REPLACE CEILING AT END OF PROJECT TO MATCH ADJACENT SURFACE. CONTRACTOR TO REPLACE EXISTING RESTROOM LIGHT WITH NEW LITHONIA CPANL 1X4 ALO1 SWW7 M4 LED FLAT PANEL WITH SURFACE MOUNT KIT. USE EXISTING CIRCUITING AND SWITCHING, PANEL HA2 – 277 VOLT BREAKER 5.
4. HARD LID CEILING, CONTRACTOR TO OPEN CEILING AS REQUIRED TO PERFORM WORK, CEILING TO BE SECURED PRIOR TO BUSINESS HOURS.
5. CONTRACTOR TO PROVIDE LOCKABLE ACCESS DOORS IN HARD LID CEILING AS NEEDED TO PERFORM WORK.

LEGEND

SYMBOL	DESCRIPTION
	OPPOSED BLADE VOLUME DAMPER W/ CONCEALED CEILING DAMPER REGULATOR
	NEW DUCT
	EXISTING DUCT TO REMAIN
	EXISTING DUCT TO BE REMOVED
M	OPPOSED BLADE VOLUME DAMPER W/ MOTORIZED DAMPER REGULATOR
	GRILLE OR DIFFUSER SIZE/CFM AS CALLED OUT
	SUPPLY AIR
	RETURN AIR
	EXHAUST AIR
S	THERMOSTAT/SENSOR
CO2	CO2 SENSOR

SERIES FAN POWERED BOX SCHEDULE

UNIT	PERFORMANCE MAX. PRI.	MIN. PRI.	MIN. SP IN WG	INLET SIZE	HEATING BTU/H	COIL GPM	COIL APD IN WG	COIL WPD IN WG	ELECTRICAL V/P/MCA	ELECTRICAL PANEL/BRKR	ELECTRICAL FAN HP	LOCATION	ENVIRO-TEC MODEL/SIZE	WEIGHT LB
VAV-1	1200	400	0.68	12" DIA	50,490	4.57	0.30	0.41	208/1/5.63	LA5-19,21	1/2	HALL A024	CRB 1215E	181
VAV-2	700	300	0.37	10" DIA	22,130	2.15	0.06	0.35	208/1/3.75	LA5-19,21	1/3	CHAMBER	CRB 1012E	171
VAV-3	500	200	0.31	8" DIA	18,220	1.68	0.03	0.23	208/1/3.75	LA5-28,30	1/3	STAFF A042	CRB 0812E	169
VAV-4	858	300	0.42	10" DIA	26,550	2.76	0.09	5.33	208/1/3.75	LA5-19,21	1/3	CLOSET A010	CRB 1012E	171
VAV-5	1800	500	0.89	12" DIA	75,940	7.37	0.37	1.41	208/1/9.88	LA5-36,38	1	COURT RM A	CRB 1225E	204
VAV-6	1800	500	0.89	12" DIA	75,940	7.37	0.37	1.41	208/1/9.88	LA5-32,34	1	COURT RM B	CRB 1225E	204
VAV-7	1950	600	0.99	14" DIA	79,350	7.83	0.43	1.61	208/1/9.88	LA5-14,16	1	STAFF A042	CRB 1425E	205
VAV-8	1200	400	0.49	12" DIA	35,050	3.60	0.10	1.33	208/1/9.88	LA5-28,30	1	STAFF A042	CRB 1225E	197

NOTES:
HEATING BASED ON 65 DEG F EAT 100 DEG F LAT, 160 DEG F EWT AND 140 LWT TEMPERATURES
PROVIDE WITH TERMINAL STRIP TO CONNECT AUTOMATED LOGIC CONTROLS.
CONTRACTOR TO FIELD VERIFY FAN POWERED BOX ARRANGEMENT PRIOR TO ORDERING.
PROVIDE WITH MANUFACTURER'S FILTER OPTION.

AIR HANDLING UNIT SCHEDULE

UNIT	AHU MAKE/MODEL	SUPPLY AIRFLOW CFM	SUPPLY ESP (IN WG)	SUPPLY FAN BHP	RETURN AIRFLOW CFM	RETURN ESP (IN WG)	RETURN FAN HP	HOT WATER COIL TMBH	DX COIL TMBH	ELECTRICAL (V/PH)	CIRCUIT 1 FLA	CIRCUIT 1 BREAKER	CIRCUIT 2 (V/PH)	CIRCUIT 2 FLA	CIRCUIT 2 BREAKER	WEIGHT (LBS)	WIDTH/ LENGTH (IN)	NOTES
AHU-1	MILLER PICKING/MPI-62x76	10,000	2.0	8.30	9,000	1.0	10.0	475	338	460/3	27.3	45	120/1	N/A	20	7,505	72/188	a,b,c,d,e,f,g

a. HEATING COIL 160 F IN 140 F OUT, 48.7 GPM, WPD 14.8, APD 0.05
b. DX COOLING COIL: EAT (F) DB 80 WB 67, 10,000 CFM, APD 0.63
c. DX COILING COIL TO BE COMPATIBLE WITH AAON CONDENSING UNIT.
d. AIR HANDLER TO BE DISASSEMBLED ONSITE TO PASS THROUGH DOOR OR LOUVER THEN REASSEMBLED IN MECHANICAL ROOM, MANUFACTURER'S REPRESENTATIVE TO BE PRESENT DURING DISASSEMBLY AND REASSEMBLY.
e. PROVIDE WITH 2" PLEATED MERV 8 PRE-FILTERS AND 4" MINI PLEAT MERV 13 PRIMARY FILTERS.
f. PROVIDE WITH DAMPERS FOR FULL ECONOMIZER OPERATION.
g. PROVIDE WITH VFDS ON SUPPLY AND RETURN FAN FOR VAV OPERATION.

NOTES
CONTRACTOR TO RECIEVE PIPING RECOMMENDATIONS FROM EQUIPMENT SUPPLIER BASED ON ACTUAL LINE ROUTING.
UNITS TO BE R-410A OR APPROVED
CONTRACTOR TO FIELD VERIFY DIMENSIONS PRIOR TO ORDERING EQUIPMENT.
MINIMUM CFM TO BE SET AT 1,000 CFM TO MATCH AREA EXHAUST.
PROVIDE UNIT WITH SMOKE DETECTION SHUT DOWN, PROVIDE ALARMS PER OMSC.

CONDENSING UNIT SCHEDULE

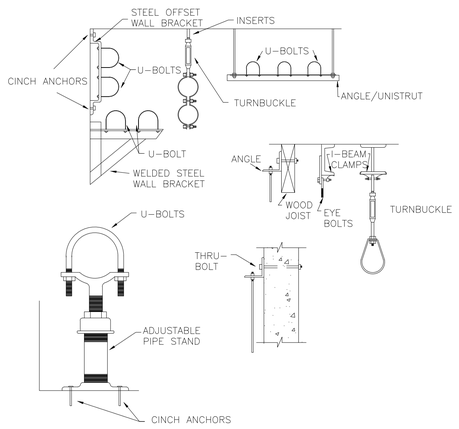
UNIT	CONDENSING UNIT MAKE/MODEL	CAPACITY @ 48.6F MBH	CIRCUIT 1 MBH	CIRCUIT 2 MBH	EER	CONDENSING UNIT ELECTRICAL (V/PH)	MCA	BREAKER	CONDENSING UNIT WEIGHT (LBS)	CONDENSING UNIT WIDTH/ LENGTH (IN)	NOTES
CU-1	AAON/CFA-031	396.9	206.8	191.1	12.5	480/3	59	70	2294	84/122	a,b,c,d,e,f

a. PROVIDE WITH 14" CURB, WITH SPRING ISOLATION BASE RAIL SIZED BY MANUFACTURER FOR EQUIPMENT.
b. PROVIDE WITH FUSED DISCONNECT TO MATCH MANUFACTURER'S MOCP.
c. PROVIDE 110 SERVICE RECEPTACLE
d. PROVIDE REFRIGERANT PIPING, CONTROL WIRING AND ACCESSORIES FOR A COMPLETE AND OPERATING SYSTEM.
e. BOTH CIRCUITS TO HAVE VARIABLE CAPACITY COMPRESSORS (VARIABLE REFRIGERANT CIRCUITS)
f. BOTH COMPRESSORS TO BE ABLE TO RECEIVE 0-10 ANALOG SIGNAL FOR 0-100 PERCENT SPEED CONTROL, SOLENOID/LOADER STAGING UNACCEPTABLE

NOTES
CONTRACTOR TO RECIEVE PIPING RECOMMENDATIONS FROM EQUIPMENT SUPPLIER BASED ON ACTUAL LINE ROUTING.
UNITS TO BE R-410A OR APPROVED
UNITS TO BE R-410A OR APPROVED

14/M3 RCP-CEILING WORK

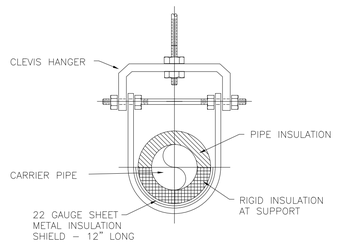
SCALE: 1/16"=1'-0"



* USE STAINLESS STEEL UNISTRUT AND FASTENERS WHERE EXPOSED TO THE OUTDOOR ENVIRONMENT.

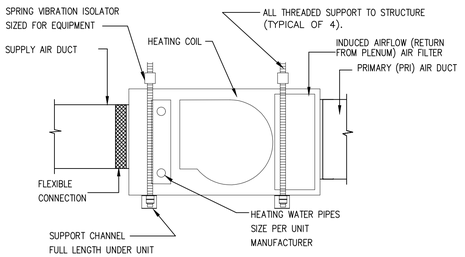
13/M3 TYPICAL PIPE SUPPORT DETAIL

NTS



10/M3 INSULATED PIPE HANGER DETAIL

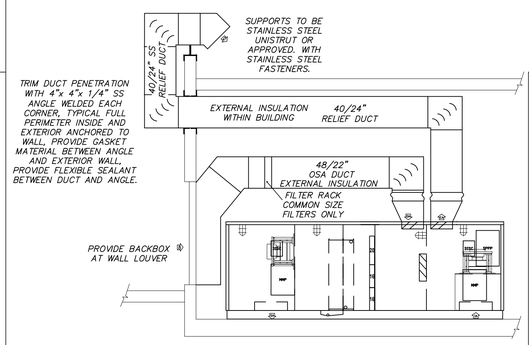
NTS



TYPICAL

9/M3 VAV BOX INSTALLATION DETAIL

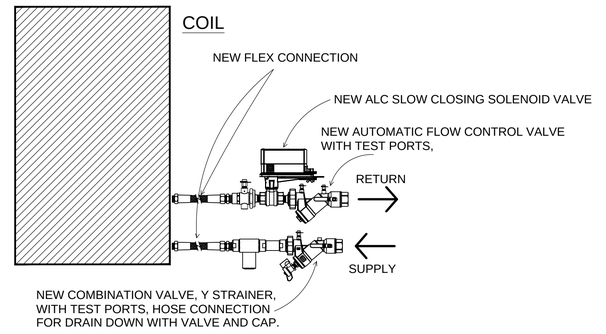
NTS



ELEVATION VIEW

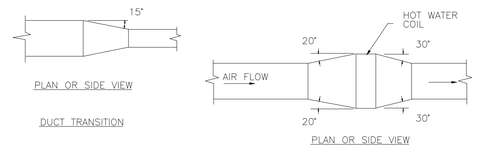
8/M3 AIR HANDLER ELEVATION

NTS



2/M3 TYPICAL COIL CONNECTION DETAIL

NTS



NOTE: UNLESS OTHERWISE INDICATED ON PLANS, MAXIMUM ANGLES SHOWN SHALL APPLY.

1/M3 DUCT TRANSITION DETAIL

NTS

Designed DB
Drawn DB
Checked DB

JULY 2014

MARION COUNTY COURT ANNEX
HVAC RENOVATION PROJECT
4000 AUMSVILLE HWY. SALEM OREGON

REGISTERED PROFESSIONAL ENGINEER
61436PE
OREGON
JUNE 7, 2011
DAVID CHARLES BACHMEIER
EXPIRES: 12/31/2023

CBD ENGINEERING, LLC
35468 RIVERSIDE DR. SW
ALBANY, OREGON 97321
(541) 619-7287

REVISIONS

Date	Description	Approved

File No. M3.DWG
Drawing No. M3
Sheet 3 of 3

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 Work Covered by Contract Documents

A. Work covers replacement of the LG VRF system in the Court Annex with a VAV system and control modifications located at the Marion County Facility, 4000 Aumsville Hwy, Salem Oregon.

1.2 Related Requirements Specified Elsewhere:

A. Section 15050: Basic Mechanical Materials and Methods.
B. Section 16050: Basic Electrical Materials and Methods.

1.3 General Summary of Work

A. Refer to specifications, plans and details for further requirements.
B. Replace LG VRF system in its entirety.
C. Provide new VAV system with main air handler, Condensing unit, hydronic heating coil, fan powered boxes, and controls.
D. Provide modifications to the electrical system for the new condensing unit, air handler, fan powered boxes and controls.
E. Contractor is responsible for ordering equipment that is capable of being installed within the structure. It is the responsibility of the contractor to ensure that the equipment can be broke down into sections in order to install equipment within the structure.
F. Factory representative to be present for any dismantling or reassembly of equipment onsite.
G. Replacement of existing KMC controls per plans to new Automated Logic Controls.

1.4 Contractor's Duties

A. Except as specifically noted, Contractor shall provide and pay for:
   1. Labor, materials and equipment, tools, construction equipment and machinery.
   2. Transportation and other facilities and services essential for proper execution and completion of his work.
B. Give required notices, comply with codes, ordinances, rules regulations and other legal requirements of public authorities which bear on performance of work.
C. Promptly submit written notice to The Engineer of observed variance of Contract Documents from legal requirements. Assume responsibility for work known to be contrary to such requirements when notice is not forwarded.
D. Maintain safe and healthy work environment.
E. Enforce strict discipline and good order among employees.

F. Employ only persons skilled in assigned tasks.
G. Employees onsite must have passed a background check prior to working onsite.
H. Contractor responsible for observing all the Marion County Requirements for contractors onsite, no wearing of orange, no tobacco use onsite, no weapons, refer to Marion County for additional requirements.
I. Contractor to do a walk through with Marion County staff at the end of each shift to verify everything is secured and nothing has been left behind that could be a potential harm to any persons.

1.5 Permits and Fees

A. The contractor secures the building permit.
B. The Contractor will pay all plan checking and permit fees.
C. It is not the Sub Contractor's responsibility to make certain that drawings and specifications comply with codes and regulations.

1.6 Contractor's use of premises

A. Confine operations at site to areas permitted by law, ordinances, permits and Contract Documents.
B. Do not unreasonably encumber site with materials or equipment.
C. Do not load structure with weight that will endanger structure.
D. Assume full responsibility for protection and safekeeping of products stored on premises.
E. Move any stored products which interfere with operations of Owner or other Subcontractors.
F. Contractor or contractor's force will not have access to the Project Site or improvements outside the limits-of-work, except as expressly invited and accompanied by Owner Representative.

1.7 Building Activities During Construction

A. The building and site will be occupied and open for business during construction. Schedule all activity with the Project Coordinator.
B. Subcontractors are to schedule work around activities of owner.
C. Noisy work is to be conducted with approval from the owner and after business hours.
D. Coordinate all activities with the Owner to assure full and continuing use of the occupied facilities.

END OF SECTION

SECTION 01027

APPLICATION FOR PAYMENT

PART 1. GENERAL

1.1 Schedule of Values

A. Prior to initiation of work, submit a Schedule of Values covering various line item parts of work including quantities aggregating the total sum of the Contract. Form and content shall be acceptable to Owner and Engineer.
B. Submit updated Schedule of Values with application for payment and progress schedule form every 30 days.

1.2 Application for Payment

A. Execute Applications for Payment on AIA Document G702 and G703.
B. Include itemized statements of original sum, additions and deductions due to Change Orders, deduction for previous payments and sum remaining due. Round off values to the nearest dollar.
C. Obtain original sums from Schedule of Values.
D. Include Retainage as required by General Conditions and Supplementary conditions.
E. Submit Application for Payment every 30 days.

1.3 Change Order Procedure

A. Execute a copy of AIA Document G713, Construction Change Directive.
B. Complete accounting and indicate new Contract Sum and new Date of Completion as revised by Change Order.
C. Submit an itemized list of labor and materials including overhead and profit with each Construction Change Directive.
D. Submit copies of estimating sheets when requested by the Engineer.
E. Owner will complete authorized Change Directives using AIA Form G701, Change Order, to adjust Contract Sum or Contract Time as applicable.
F. When field instructions or document interpretations are issued which, in the opinion of the Contractor, require additional costs to the Owner, do not proceed without written authorization. Additional work undertaken without written directive by the Engineer, for whatever reason, will not be considered for additional cost.

END OF SECTION

SECTION 01050

COORDINATION OF WORK

PART 1 GENERAL

1.1 General

A. The General Contractor is responsible for overall coordination of the Project.
B. Cooperation among the various crafts and contracts is essential for the proper execution of the work and is the responsibility of each Subcontractor.

1.2 Job Conditions

A. Contract Documents show and describe overall installation, capacities and characteristics of equipment.
B. Mechanical and electrical drawings are diagrammatic and do not show every offset, bend or elbow which may be required for installation in the space provided.
C. Include all items required for a complete installation whether or not shown or described.
D. Follow indicated routing of pipes, ducts and conduits as closely as practicable.
E. Provide clearances and headroom and utilize spaces efficiently to maintain adequate accessibility for future maintenance, repairs and additions.
F. Relocate installed work which does not provide adequate accessibility.
G. Existing facilities are located as accurately as can be determined from existing drawings and on-site inspections. Verify actual conditions.

1.3 Coordination

A. Perform all essential work to receive or join with work of all trades, cut new services into existing mains, extend piping and make essential connections required to prevent interruption of service to existing facilities.
B. Coordinate work to provide adequate clearances for installation and maintenance of equipment.
C. Contract Documents are arranged for convenience only and do not necessarily determine which trades perform the various portions of the work.

END OF SECTION

SECTION 01070

CUTTING AND PATCHING

PART 1 GENERAL

1.1 Related Requirements Specified Elsewhere
- A. Section 01010: Summary of Work
- B. Section 15050: Basic Mechanical Materials and Methods.
- C. Section 16050: Basic Electrical Materials and Methods.

1.2 General
- A. Execute cutting, fitting or patching of work required to:
  1. Make several parts fit properly
  2. Uncover work
  3. Remove and replace defective work
  4. Remove and replace work not conforming to requirements of Contract Documents
  5. Install specified work in existing construction.
- B. In addition to contract requirements, upon written instructions of Owner's Authorized Representative, uncover work to provide for Owner's Authorized Representative observation of covered work and remove samples of installed material for testing.
- C. Do not endanger any work by cutting or altering work or any part of it.

1.3 Submittals
- A. Prior to cutting which affects structural safety request consent to proceed with cutting by written notice to Engineer.
- B. Include identification of Project, description of affected work, necessity for cutting and effect on other work or structural integrity of Project.
- C. Describe proposed work and designate scope of cutting, patching and refinishing.
- D. Designate party responsible for cost of cutting and patching.

1.4 Payment for Costs
- A. Cost caused by ill-timed or defective work or work not conforming to Contract Documents including costs for additional services of Owner is to be borne by the party responsible for the deficiency.

PART 2 PRODUCTS

2.1 Materials

- A. For replacement of work removed, comply with specifications for type of work to be done.

PART 3 EXECUTION

3.1 Inspection

A. Inspect existing conditions of work including elements subject to movement or damage during cutting, and patching.
B. After uncovering work, inspect conditions affecting installation of new products.

3.2 Preparation

A. Prior to cutting provide shoring, bracing and support as required to maintain structural integrity of Project.
B. Provide protection from elements for other portions of Project.
C. Protect all surfaces during construction including but not limited to counter tops, floors, cabinetry, walls and ceilings. Clean affected areas on a continual basis. Protect surrounding surfaces as required.

3.3 Performance

A. Execute fitting and adjustment of products to provide finished installation conforming with specified tolerances.
B. Execute cutting and demolition by methods which will prevent damage to other work and provide proper surfaces to receive installation of repairs and new work.
C. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.
D. Refinish entire surface as necessary to provide an even finish. Refinish continuous surfaces to nearest intersections. Refinish assemblies in entirety.
E. Protect all surfaces (i.e., counter tops, floors, cabinetry, walls and ceilings) during construction.
F. Clean affected area on a continuous basis. Protect surrounding surfaces as required.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 General

A. Submit to the Engineer all shop drawings, product data and samples required by the Specifications.

B. The contractor for each bid package is solely responsible for the submittals pertaining to that work.

1.2 Subcontractor's Responsibilities

A. Each Subcontractor is required to review submittal information prior to submitting it to the Engineer to insure that it is in full compliance with the Contract Documents.

B. The Subcontractor will indicate clearly if any portion of the submittal deviates from the Contract Documents.

C. Begin no work requiring submittals prior to receiving the Engineers review.

D. Any work begun prior to the Engineer's review is at the Contractors risk.

E. The Contractor is solely responsible for installing work in accordance with the plans and specifications.

F. The review of shop drawings and product data does not relieve the Contractor of the responsibility of complying fully with the Contract Documents.

G. Errors and omissions in shop drawings not noted during the Engineers review are still the Contractor's responsibility.

H. Deviations from the Contract Documents must be specifically approved in writing by the Engineer.

1.3 Submittal Requirements

A. Schedule submission at least twenty (20) calendar days prior to the date the reviewed submittal will be needed.

B. The Engineer will review and return all submittals within seven (7) working days.

C. Resubmittal may be required for submittals not in compliance with the Contract Documents.

D. Unless otherwise noted in the specifications submit electronic copies of all required shop drawings and product information.

E. One copy will be retained by the Engineer and the remaining copies will be returned along with the review comments.

F. Include a transmittal form with all submittals listing the following information:

1. Date of Submission
2. Project Title
3. The names of Contractor, Supplier and Manufacturer

4. Identification of the product and specification section to which it applies.
5. Identification of any deviations from the Contract Documents.
6. Contractor's stamp signed by the Contractor indicating that the submittal has been reviewed and is in compliance with the Contract Documents.
7. Transmittal Form: AIA Document G810 or Contractor’s typical office transmittal form, as selected at Preconstruction Conference.

END OF SECTION

SECTION 01350

PROJECT SCHEDULE

PART 1 - GENERAL

1.1 General

A. Completion of this project on schedule is critical.
B. Contractor is expected to furnish labor, materials and equipment as required to meet the project schedule.

1.2 Project Schedule

A. Substantial Completion Date – refer to owner's general conditions section H 2.1.
B. Final Completion Date – refer to owner's general conditions section H 2.1.
C. The General Contractor will provide an initial Project Schedule indicating the start dates and durations of all contract work at the preconstruction meeting, for owner review.
D. Notify the Engineer immediately if for any reason the schedule cannot be met.
E. Inability to meet the schedule may be grounds to select another Contractor.
F. Review the schedule for conflicts which may affect the work.

1.3 Schedule Contents

A. Contractor's Construction Progress Schedule:
    1. Show complete sequence or construction by activity.
    2. Show dates for beginning, and completion, of each major element of work.
B. Submittal Schedule for Shop Drawings, Product Data, and Samples:
    1. Show dates for Contractor's submittals.
    2. Show dates approved submittals will be required from the Engineer.
C. Products Delivery Schedule

1.4 Compliance with Schedules

A. Contractor furnished materials, labor and equipment necessary to comply with the schedule.
B. The Contractor will begin work promptly when notified by the Engineer and continue with sufficient men so as not to delay the progress of the job.
C. Liquidated damages will be assessed at the rate of $300 per calendar day with the accumulated total damages not to exceed 5% of the Contractor's total Contract amount.
D. If any site condition prevents a contractor from keeping the Schedule, the Contractor must notify the Engineer immediately.

E. If the situation cannot be remedied within 24 hours the Contractor may notify the Engineer within 72 hours and request an extension of time.
F. Contract Time Extensions will be issued solely at the discretion of the Owner.
G. Delays which are not brought to the attention of the Engineer as outlined above will not be considered for extensions.
H. Should the Contractor fail to employ sufficient competent help to complete the work in the given time, the Owner may, after giving forty-eight hours written notice, by letter or telegram mailed to the last known address of the Contractor, employ help to complete the work and charge the same to the Contractors account and/or charge the Contractor any penalties due to their failure to complete on the given date.
I. If the cost of completing the work exceeds the contract price, the Contractor agrees to reimburse the Owner for any sums over and above the contract price.
J. If the cost of completing the work does not exceed the remaining contract amount, any excess will be paid to the Contractor.

1.5 Revision of Schedule

A. The Owner reserves the right to update the Project Schedule Periodically to reflect the actual progress of the Project.
B. Revised schedules will be distributed to all Contractors.
C. In the event that the Contractor feels for any reason unable to comply with the revised schedule he must notify the Engineer in writing within 48 hours.
D. If the Engineer is not notified of any problems, the new schedule will become the official job schedule.

END of SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND SERVICES

PART 1. GENERAL

1.1 Temporary Utilities

A. Temporary Water
   1. Water and toilets will be provided by the Owner for construction purposes.
   2. The Owner will pay for cost of water for clean-up and general wash down functions.

B. Temporary Heat and Ventilation
   1. General Contractor to coordinate with owner down time of the cooling systems. Contractor to work with owner to provide elevated OSA, night flushes or incorporate other cooling strategies to help maintain comfort in the facility during construction.
   2. Comply with manufacturer's directions and these specifications for necessary environmental conditions
   3. Contractor to verify that air is flowing in each area when the VRF box is removed and the VAV box is installed. At no time is there to be no airflow in any area during business hours.

C. Temporary Barricades
   1. Sub-contractor provides barricades and lighting to protect pedestrian and vehicular traffic during their work.

D. Temporary Fire Suppression
   1. Sub-contractor provides fire extinguishing equipment suitable for suppression of fire in combustible materials on site.
   2. Maintain current inspection tags on all fire suppression equipment.

E. Construction Phone.
   1. At all times during construction, from date of Project initiation until substantial completion, Contractor agrees to maintain a representative, capable of administering contract matters, and in contact by cellular phone, 24 hours a day, 7 days a week, same number maintained through duration of projector or in person at the job site.

1.2 Requirements of Regulatory Agencies

A. Comply with applicable federal, state and local codes.

1.3 Submittal

A. Before beginning construction of each temporary facility, provide information and drawings as required to describe fully the facilities.

1.4 Toilet Facilities

A. Contractor may use existing building toilet facilities for normal personal use. Restrooms and fixtures may not be used for any construction purpose, other then to perform work as outlined in the construction documents. Contractor to clean any soil or debris, repair any damage resulting from use of the building toilet facilities.

PART 2 PRODUCTS

2.1 Materials

A. All materials and equipment to be fully listed for the actual use.

PART 3 - EXECUTION

3.1 Preparation

A. Consult with Owner to review jobsite areas required for field offices, material storage and stockpiles, equipment storage, access to different locations, etc., for approval of the Owner. At no time is the Contractor to drive any vehicle over the septic system.

3.2 Performance

A. Confine equipment, apparatus and storage of materials to minimum areas acceptable to the Engineer.
B. The Owner will not be responsible for protection of materials and equipment from damage, pilfering, etc.
C. Install temporary facilities in such manner that finished work will not be damaged.
D. Keep facilities well maintained.
E. Fires from burning debris, scrap, etc., will not be permitted.

3.3 Vehicle Parking & Material Storage Spaces

A. Locate vehicle parking and material storage as determined at Preconstruction Conference.

3.4 Roads, Traffic Way

A. Traffic to building site will be allowed only where roadways are indicated, and then only where use will not damage work of other contracts.
B. Do not allow vehicles with lugs or flanges on paved surfaces.
C. Provide heavier traffic bearing surfaces where required for construction equipment.

3.5 Dust Control

A. Protect persons and property, both on and off site and within existing buildings, from injury and discomfort caused by dust as a result of work.
B. Use industry accepted materials which will produce no detrimental effects on completed work.

3.6 Protection of Existing Facilities

A. Protect existing survey monuments, fence lines, underground utilities and drainage facilities not indicated to be removed against displacement, damage or removal.
B. Fully restore, to original condition, existing facilities disturbed by operations of this Contract at no additional cost to Owner.

3.7 Adjust and Clean

A. Relocate temporary facilities as required during job progress.
B. Except as otherwise directed, remove temporary facilities at completion of job in accordance with Owners' direction.
C. Restore disturbed areas to a satisfactory condition, similar to surrounding areas.

END of SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes special procedures and Work described as part of project closeout, and a description of closeout submittals such as record drawings, operation manuals, and warranties.

B. Items to be Completed or Corrected: Contractor inspects the Work and prepares a list of deficiencies for submittal to the Engineer.

1.2 SYSTEM DESCRIPTION

A. When the Contractor considers the Work substantially complete, he shall submit to the Engineer a written notice that Work (or designated portion thereof) is substantially complete, together with a list of minor work to be completed or corrected. Within a reasonable time after receipt of this notice, the Engineer will make an inspection to determine the actual status of completion.

B. Should the Engineer determine that the work is in fact not substantially complete, he will promptly notify the Contractor in writing, giving the reasons. The Contractor shall remedy the deficiencies in the Work, and send a second written notice of Substantial Completion to the Engineer.

C. When the Engineer concurs that the Work is substantially complete, he will:
   1. Notify the Owner of, and accompany the Owner on an inspection of the Project.
   2. Prepare a Certificate of Substantial Completion on AIA Form G704, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Engineer and the Owner.
   3. Submit the Certificate to the Contractor and the Owner for their written acceptance of the responsibilities assigned to them in the Certificate.

D. The Contractor will be allowed no longer than 30 calendar days from the date of Substantial Completion to request that the Engineer make his final inspection for acceptance as final completion.

E. When the Contractor considers the Work Complete, he shall submit a letter to the Engineer stating that the Contract Documents have been reviewed, and that the Work has been inspected for compliance with Contract Documents.
   1. Submission implies that the Contractor has, to the best of his knowledge, completed the Work in accordance with the Contract Documents, including "punch list" items, that equipment and systems have been tested in the presence of the Owner and are operational, and that the Work is completed and ready for final inspection and for

certificate of occupancy by the local code enforcement agency.

2. The Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of the Contractor's letter.

F. If the Engineer considers the Work incomplete or defective, he will promptly notify the Contractor in writing, listing the incomplete or defective Work, and send a copy to the Owner. The Contractor shall then take immediate steps to remedy the stated deficiencies, and send second written notice indicating that the Work is complete, whereupon the Work will be re-inspected. When the Project is determined to be acceptable under the Contract Documents, the Contractor may proceed with closeout submittals.

1.3 SUBMITTALS

A. Project record documents/drawings one (1) electronic and (2) hard copies.
B. Evidence of compliance with requirements of governing authorities including the certificate of occupancy, and certain other certificates of inspection and use permits as required for elevators, wheelchair lifts, and other mechanical and electrical equipment.
C. Schedules, Reports, and Product Data: Finalized copies of schedules, reports, and product data submitted under Division 1 Section "Submittal Procedures". Also comply with all requirements of Divisions 15 and 16.
D. Operations and Maintenance Manuals: Operation instructions and maintenance data, including maintenance personnel instructions, service manuals, and specifications, to be bound in black 3-ring binders, indexed with dividers, for a legible, permanent reference. Submit one (1) electronic and (2) hard copies of instruction books which shall include the following information:
    1. Binder covers with title "Operations and Maintenance Manuals", the title of the Project, and subject matter for the binder when multiple binders are used.
    2. Name, address, and phone number of the firm/person who installed the equipment or system.
    3. Name, address and phone number of the nearest service facility authorized by the manufacturer.
    4. Complete technical information, such as electrical and mechanical schematics, diagrams, parts lists, data sheets, connection details, and similar data.
    5. Operating instructions such as start up procedures, inspection and maintenance routines.
    6. If standard product literature covers more than one model type, the correct model number and data for the item installed shall be neatly checked off in ink.
    7. If the system or equipment is unique, custom written information shall

be provided.

8. Schedule as many training sessions as necessary with the maintenance personnel. Cover topics such as system start-up, operation and maintenance procedures. Training sessions shall be conducted by the appropriate subcontractors, with the assistance from the Engineer.

E. All warranties and bonds.
F. Keys and badges.
G. Spare parts and extra stock.
H. Evidence of payment, release of liens and final wage certificates.
I. Certificate of insurance for products and completed operations.
J. Final payment and release of retainage will be withheld until all closeout submittals have been received and approved by the Owner.

1.4 Related Requirements

A. Section 00700 – General Conditions: Fiscal Provisions, legal submittals and related administrative requirements.
B. Section 01010 – Summary of Work
C. Section 01500 – Construction Facilities and Services, Cleaning During Construction.
D. Other related Sections.

END OF SECTION

SECTION 01710

CLEANING

PART 1 GENERAL

1.1 Related Requirements Specified Elsewhere

A. Section 01010: Summary of Work
B. Section 01050: Coordination.
C. Section 01700: Contract Closeout.
D. Respective specification sections.

1.2 General

A. Maintain Owner's property and public properties free from accumulations of waste, debris and rubbish caused by operations.
B. Remove crates, cartons and other flammable waste materials from work areas at end of each working day.
C. Areas inaccessible after completion of project are to be left free of debris before space is closed in.
D. Exercise caution to avoid marring, soiling or otherwise defacing finished surfaces.
E. Clean and restore defaced surfaces to original condition.
F. Clean up immediately following completion of each trade's work. Clean up to be performed on a continuous basis. Remove all debris at the end of each shift.
G. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials; clean all sight-exposed surfaces and leave project clean and ready for occupancy.

1.3 Safety Requirements

A. Maintain project in accord with applicable safety and insurance standards.
B. Prevent accumulations of waste, debris and rubbish which create hazardous conditions.
C. Provide adequate ventilation during use of volatile or noxious substances.
D. Do not burn rubbish and waste materials; remove from Owner's property and legally dispose.
E. Contractor to provide owner with 24 hour prior notice to any hot work being performed. Contractor to provide owner with hot work permit and fire watch protocol meeting owner’s requirements.

1.4 Cleaning Materials

A. Use only materials recommended by manufacturer of surface to be cleaned.
B. Use cleaning material only on surfaces recommended by cleaning

materials manufacturer.

1.5 Cleaning During Construction

A. Contractor to provide waste removal during construction.
B. General Contractors are to clean up debris generated by their subcontract and deposit in designated containers.
C. Affected areas are to be cleaned on a continuing basis.
D. Protect all surfaces during work.
E. Subcontractors are to ensure that building, grounds and public properties are maintained free from accumulations of waste materials and rubbish.
F. At reasonable intervals (end of each shift) during progress of work clean site and public properties and dispose of waste materials, debris and rubbish.
G. Handle waste materials, debris and rubbish in a controlled manner with as few handling as possible; do not drop or throw materials from heights.

1.6 Final Cleaning

A. Each subcontractor is to gather all debris generated by their subcontract and place it in the designated containers.
B. Clean up performed for any subcontractor will be charged against the subcontract amount.
C. Leave equipment in an undamaged, bright, clean and polished condition.
D. Recleaning will not be required after the project has been inspected and accepted unless later operations of Contractor make recleaning of certain portions necessary.
E. After completion of work, remove temporary buildings, structures, fences, scaffolding, surplus materials and rubbish of every nature from Owner's property.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for project record drawings.
B. Maintain at Project Site for Owner, one (1) record copy of:
   1. Contract Drawings and Project Manual.
   2. Addenda
   3. Change Orders and other Contract modifications.
   4. Field Orders and other written instructions.
   5. Approved shop drawings, product data, and samples.
   6. Field test reports.
C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section “Contract Modification Procedures”.
   2. Division 1 Section “Submittals”.
   3. Division 1 Section “Quality Control”.
   4. Division 1 Section “Contract Closeout”.
   5. Division 15 Section – Mechanical
   6. Division 16 Section – Electrical

1.3 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store record documents apart from documents used for construction.
   1. Do not use record documents for construction purpose.
   2. Provide files, shelving, and cabinets necessary to safely and securely store documents and samples.
B. Maintain documents clean, dry, legible, and in good order.

1.4 DRAFTSMAN’S QUALIFICATIONS

A. Drafting must be accurate and legible.
B. If Engineer deems submitted drafting to be unacceptable, redraft until acceptable at no additional cost to Owner.

1.5 MARKING DEVICES

A. Waterproof, felt-tip pens.
B. Color code, unless otherwise directed or approved.
   1. Red: Document changes.

2. Green: Work deleted.
3. Blue: Dimensional and other notations.

1.6 REQUIRED DRAWINGS

A. Maintain one (1) black-line photocopy of Contract drawings as work set, using marking devices specified above to record all Contract changes.
B. Prior to submittal, transfer recorded information to CADD disks provided by Owner; submit revised CADD disks and reproducible transparency, provided by Contractor.
   1. Changes made to the Drawings pursuant to changes in the Work which are not Owner-initiated, including all changes made for the coordination of Contractor or subcontractor work or for the convenience of Contractor or a subcontractor, will be made on CADD disks at Contractor's or subcontractor's cost. This includes, without limitation, changes to the Work of site utilities and Divisions 15 and 16.
C. Contractor may retain a copy of the work-set for his records.
D. Drawings for use as base drawings are available from the Engineer as electronic computer data.

1.7 RECORDING

A. Label each document PROJECT RECORD in neat, large, printed letters.
B. Record information concurrently with construction progress. Project records will be reviewed on a monthly basis with Contractor's Application for Payment.
C. Do not conceal any work until required information is recorded. All concealed work to be photographed and added to the record documents.
D. Legible mark drawings to record the following actual construction:
   1. Location of internal utilities and appurtenances, including backing materials, concealed in construction, referenced to visible and accessible features of structure.
   2. Field changes of dimensions and details.
   3. Changes made by Change Order, Job Instruction or Engineer's Supplemental Instruction with reference to document number.
   4. Details not shown on original Contract drawings.
E. Legibly mark specifications and any addenda to record the following:
   1. Manufacturer, trade name, catalog number, and supplier of each product actually installed.
   2. Changes made by change order, job instruction, or Engineer's supplemental instruction.
   3. Note related record drawings and product data, where applicable.

1.8 SUBMITTALS

A. Review status of record documents will be required by Engineer at 75% Project completion.
B. Contractor will provide (1) one set of current dated record documents to

be reviewed by Engineer.

C. Engineer will review documents for accuracy and information quality to date.
D. Engineer will return documents to Contractor with comments and or corrections as required.
E. At Contract close-out deliver record documents to Engineer for forwarding to Owner.
F. At Contract close-out Contractor shall review with the Owner's Representative and the Engineer which submitted samples are to be submitted to Owner for record purpose.
G. Accompany submittal with transmittal letter in duplicate, containing:
    1. Project title.
    2. Date.
    3. Contractor's name and address.
    4. Title and number of each record document.
    5. Signature of Contractor or his authorized representative.

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for:
   1. Compiling product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
   2. Instructing Owner's personnel in maintenance of products and in operation of equipment and systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Submittals".
   2. Division 1 Section "Project Record Documents".
   3. Division 1 Section "Contract Closeout".

1.3 QUALITY ASSURANCE

A. Arrange for data to be prepared by personnel:
   1. Trained and experienced in maintenance and operation of described products.
   2. Completely familiar with requirements of this Section.
   3. Sufficiently skilled as technical writer to communicate essential data.
   4. Sufficiently skilled as draftsmen to competently prepare required drawings.

1.4 FORM OF SUBMITTALS

A. Prepare data in form of instructional manual for use by Owner's personnel.

B. Format:
   1. Size: 8 ½ x 11 inches.
   2. Paper for Typing: 20 lb minimum, recycled white.
   3. Text: Manufacturer's printed data or neatly typed.
   4. Drawings:
      a. Reinforced edges against tear-out.
      b. Bind-in with text.
      c. Fold larger drawings to match size of text pages.
   5. Provide fly-leaf for each separate product.
   6. Identify each fly-leaf with labeled tabs.

7. Cover: Identify each volume with typed or printed title “Operating and Maintenance Instruction”, and list the following:
    a. Project Title
    b. Identity of general subject matter contained in manual.

1.5 BINDERS

A. Commercial quality, 3-ring type with durable and cleanable plastic covers.
B. When multiple binders are used, correlate data into related consistent groupings.

1.6 MANUAL CONTENT, GENERAL

A. Contractor, name of responsible principal, address and telephone number.
B. Each product, including name, address and telephone number of:
    1. Subcontractor or installer.
    2. Recommended maintenance contractor.
    3. Local source of replacement parts.
    4. Product name and other identifying symbols as set forth in Contract Documents.
    5. Product data:
        a. Include only those sheets which are pertinent to specific product.
    6. Annotate each sheet to:
        a. Clearly identify specific product or part installed.
        b. Clearly identify data applicable to installation.
        c. Delete references to inapplicable data.

1.7 DRAWINGS:

A. Supplement product data with drawings where necessary to clearly illustrate:
    1. Relation of component parts.
    2. Control and flow diagrams.
    3. Do not use Project Record Documents as maintenance drawings.

1.8 WRITTEN TEXT:

A. Provide where necessary to supplement product data drawings.
    1. Organize in consistent format under separate headings for different procedures.
    2. Provide logical sequence of instruction for each procedure

1.9 WARRANTIES, BONDS, AND MAINTENANCE CONTRACTS:

A. Provide copy of each
    1. Include the following:
        a. Proper procedures in event of failure.
        b. Instances which might affect validity of warranties, bonds or Contracts.

1.10 ADDITIONAL DATA

A. Prepare and include the following:
   1. Additional data when need becomes apparent during instruction of Owner's personnel.
   2. Additional data specified in other sections of Specifications to be included.

1.11 SUBMITTAL SCHEDULE

A. Preliminary Draft:
   1. Submit two (2) copies of proposed format.
   2. Owner's Representative and Engineer will review and return one (1) copy with comments.

B. Final submittal:
   1. Submit, in final form, one (1) copy of complete data 15 days prior to Final inspection.
   2. Copy will be returned with comments.
   3. Submit one (1) electronic and two (2) hard copies in approved final form, within 10 days of Final Inspection

END OF SECTION

SECTION 15010

GENERAL MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Section 15010 details the general requirements for the Division 15 contractor for the installation of the mechanical equipment and systems described in the Contract Documents.
B. Division 15 contractor to provide labor, materials for a complete and operable system complying to all the conditions in the Contract Documents. Order of priority of Contract Documents are as follows:
   1. Change Orders
   2. Addendums
   3. Schedules
   4. Specifications
   5. Details
   6. Drawings
C. Drawings are diagrammatic only, to show general arrangement of mechanical equipment and accessories. Coordinate location of all mechanical equipment with other trades prior to rough in. Provide necessary offsets or transitions as required to install the system in the space provided.
D. Provide all required accessories for a complete and operable system as intended, review all manufacturer installation requirements prior to rough in. Notify engineer of any conflict between manufacturer's requirements and Contract Documents prior to proceeding with installation.
E. Contractor to verify all installation requirements prior to ordering of equipment. Verify correct voltage, amperage, physical size, mounting, and access requirements prior to ordering. Contractor to field verify fan powered box orientation prior to ordering. Notify engineer of discrepancies prior to ordering.
F. Contractor to provide all required transitions from duct or pipe size shown to unit connections. Contractor to provide flexible connections at mechanical equipment per Contract Documents, EXCEPT for fan powered box primary air inlet.
G. Contractor to notify owner if asbestos is found on the project immediately. No materials containing asbestos are to be used on project.
H. Contractor to submit for and obtain all permits required to perform the work as described. Contractor is responsible for the payment of the permits and coordination of all inspections required by the local

authority having jurisdiction.

I. Contractor to install all equipment and accessories in a professional manner, run piping and duct work parallel to the building, install equipment plumb and level, with adequate access for maintenance. Provide permanent plastic laminate labels with equipment identification matching Contract Documents.

J. Contractor to provide seismic restraints for all equipment as required by the AHJ. Provide stamped structural calculations as required and submit to the AHJ as requested for approval. Provide all special inspections as required by the AHJ.

1.2 RELATED DOCUMENTS

A. Division 15 contractor is bond by General Conditions , Division 15, Division 16, supplementary conditions and the associated drawings.

1.3 REFERENCE STANDARDS

A. Compliance with the codes and standards of the following organizations as applicable to the work being performed:

1. Codes, Rules and Regulations of the State of Oregon.
2. Local county/city Codes, Rules and Regulations
3. AMCA
Air Moving and Conditioning Association
4. ADC
Air Diffusion Council
5. NEMA
National Electrical Manufacturers Association
6. FM
Factory Mutual
7. NFPA
National Fire Protection Association
8. ASTM
American Society for Testing Materials
9. UL
Underwriters Laboratories, Inc.
10. NEC
National Electrical Code
11. ASME
American Society of Mechanical Engineers
12. ANSI
American National Standards Institute
13. OSHA
Occupational Safety and Health Act
14. BSA
Board of Standards and Appeals
15. MEA

Materials and Equipment Acceptance
16. ASHRAE
American Society of Heating, Refrigeration and Air Conditioning Engineers.
17. AWWA
American Water Works Association
18. ARI
American Refrigeration Institute
19. SMACNA
Sheet Metal and Air Conditioning Contractor's National Association
20. ASA
Acoustical Society of America
21. AGA
American Gas Association
22. AABC
American Air Balance Council
23. NEBB
National Environmental Balancing Bureau

1.4 DEFINITIONS

A. "Provide" means furnish and install, complete, with the specified material or equipment and perform all required labor to make a complete and functioning installation.
B. “Install” means to provide labor and materials to receive, unload, assemble, place, mount, seismically brace, connect to all required services, clean, start-up, adjust and commission.
C. “Clean” means to remove all debris, to wash cabinet inside and out with applicable cleaning solution, chemically clean coils as required to remove trapped dirt, comb coils straight after cleaning, remove all dirt and debris from fan blades, provide new filters, acid flush coils to remove sediment, flush out piping systems until discharge is clear, remove sediment from all strainers, lubricate and place back in service when completed.
D. “Service” means to clean equipment, lubricate equipment per manufacturer, replace belts, replace sheaves (as required), replace filters, cycle all dampers/actuators, tighten/adjust all linkage, run equipment through all cycles and verify correct operation. Provide documentation of recorded inputs/outputs after servicing.
E. “AHJ” Authority Having Jurisdiction.

1.5 PROTECTION

A. Contractor is responsible for all mechanical equipment and accessories until final completion of the project. Contractor to protect all mechanical equipment and accessories provided from damage, theft,

and contamination. Contractor is responsible for the repair/replacement of any damaged or stolen equipment or accessories. Contactor is responsible for cleaning any and all equipment contaminated before final completion. Any equipment used prior to final completion must be protected from debris by temporary placement of filters on all intakes. Contractor responsible for entire system to be clean at the time of final completion, if debris has contaminated the system during construction the contractor is responsible for removal of debris prior to final acceptance.

1.6 CUTTING AND PATCHING

A. Contractor to coordinate all required penetrations with other trades prior to rough in.
B. Contractor is not to cut or notch any framing material without direction from engineer. Contractor will be required to repair/replace any framing member damaged by cutting or notching if done so without prior approval.
C. Contractor to patch all penetrations or wall coverings where equipment has been removed, replaced or abandoned to match the adjacent surface.

1.7 SUBMITTALS

A. The contractor shall submit prior to ordering or construction of the following equipment and accessories for review. Submittals to include shop drawings, equipment performance, equipment efficiencies, listings, coatings, accessories, warranties and supplier information. Submittals to note on first page any differences between specified item and submitted item.
    1. Condensing Unit.
    2. Air Handling Unit.
    3. Fan Powered Boxes.
    4. Lighting fixtures.
    5. Seismic calculations for equipment.
    6. Piping materials, valves, hangers, supports and accessories
    5. Control diagrams and control sequences
    6. Insulation
    7. Paint
    8. Ceiling tile

1.8 OPERATION AND MAINTENANCE MANUALS (O&M)

A. O&M manuals to include submitted information.
B. Manufacturer’s factory start up forms completed as required for warranty. Warranty information for all equipment.

C. Equipment suppliers contact information.
D. Equipment service requirements and spare parts list.
E. Material Safety Data Sheets on all chemicals provided on the project.
F. Reports.
    1. Compliance with listings and approvals for equipment and for fire ratings.
    2. Acceptance certificates from inspecting agencies.
    3. Laboratory water tests.
    4. Manufacturer's performance tests on operating equipment.
    5. Field pipe pressure testing reports.
    6. Field operating test results for operating equipment.
    7. Performance report on the balancing of hydronic system.
    8. Performance reports for vibration isolation equipment.
G. Record drawings showing all significant changes to the Contract Documents. Location of all valves and mechanical equipment access.
H. Construction pictures, provide construction pictures showing location of all equipment and accessories covered up by building materials, such as but not limited to piping in walls, above hard lid ceilings or connections/offsets not readily accessible. Label each picture and make note on as-built drawings of picture location.

1.9 SUBSTITUTIONS

A. Contractor is required to provide substitution requests per General Conditions , prior to bid closing. All substituted equipment or accessories must be of the same quality of the specified item, the contractor is responsible to verify all installation requirements prior to submission. All variations to the specified item is to be listed on the front page of the substitution request.
B. Only approved substitutions may be used on contract work.
C. Each request for substitution approval shall include:
    i. Identity of product for which substitution is requested; include specification page number.
    ii. Identity of substitution; include product description, drawings, photographs, performance and test data, and any other information necessary for evaluation.
    iii. Quality comparison of proposed substitution with specified product.
    iv. Changes required in other work because of substitution.
    v. Effect on construction progress schedule.
    vi. Cost comparison of proposed substitution with specified product.
    vii. Any required license fees or royalties.
    viii. Availability of maintenance service.
    ix. Source of replacement materials.
D. Substitution during bid period.

i. No request for substitution approval will be considered unless written request has been electronically submitted with standard form bound herein in addition to substitution documentation noted above, and has been received by owner/engineer by 5:00pm at least 10 calendar days prior to bid opening day. Requests submitted after this date will not be individually acknowledged. Owner/engineer will issue addenda prior to bid opening listing all approved substitutions.

E. Substitutions after contract award.

i. Refer to “Marion County General Conditions for Public Improvement Contracts” for additional information on substitutions after contract award.

1.10 ACCESSIBILITY

A. Contractor is to provide manufacturer’s minimum access for all equipment provided.
B. Contractor to provide adequate access to all valves, test ports, manual vents, gauges and controls for all equipment.
C. Contractor responsible to coordinate installation of all panels, ceilings, doors for adequate access.
D. Contractor responsible to maintain all access paths to new or existing equipment, locate piping, duct work out of access paths.

1.11 DEMOLITION

A. Contractor responsible for the removal of all equipment shown in the contract documents shown to be removed. Contractor to dispose of items off site.
B. Contractor responsible for patching all surfaces exposed after demolition of any existing equipment to match the adjacent surface.
C. Contractor responsible to remove all components associated with equipment being removed, including but not limited to controls, electrical back to nearest panel, duct work, piping back to the nearest main.
D. Contractor responsible to maintain all access paths to new or existing equipment, locate piping, duct work out of access paths.

1.12 TESTS

A. Contractor is responsible to provide all testing required by the AHJ and/or equipment manufacturer. The following systems are required to be tested:
1. Refrigerant piping pressure test per manufacturer recommendations and AHJ.

END OF SECTION

SECTION 15050

BASIC MECHANICAL METHODS AND MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section describes the pipe specialties for piping systems including, but not limited, to the following:
   1. Piping support
   2. Pipe
   3. Fittings

1.2 RELATED SECTIONS

A. Division 15, Division 16 Supplementary Conditions and drawings.

1.3 REFERENCES

A. ASME
B. ASTM.
C. UL

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MECHANICAL PIPE SUPPORTS

A. Provide piping support system complying with layout, elevations, slope and support frequency as indicated or required to comply with referenced or applicable codes and ordinances. Installation shall eliminate potential for stress on piping runs, fittings, bends and terminations. Isolate materials to prevent galvanic reaction and abrasive damage due to thermal expansion and vibration. Installation shall not exceed weight capacity of support.
B. Supports to be adjustable steel clevis type hanger.
C. Michigan Hanger Co. #400 or approved.

2.2 PIPE & FITTIGS

A. Refrigerant Tubing
1. Copper Refrigeration service Tube, ASHRAE 15, IMC, & ASTM B210.
2. Valves, fittings and welding conforming to ANSI B31.5, latest edition.
3. Copper, ASTM B280, labeled approved for ACR applications, nitrogen charged and sealed by manufacturer.

B. Condensate Drain Piping
1. Copper water pipe ASTM B88, Type M or L.

2.3 PIPE ACCESSORIES

A. Pipe Labels
1. ANSI/OSHA standards for pipe labeling.
2. Direction arrows.
3. Seton or approved.

B. Valve Tags
1. Brass plate 1.5” diameter, chain attached.
2. Seton or approved.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Review location of all valves prior to installation, verify adequate access for operation and service.
B. Install per manufacturer requirements and per contract drawings.
C. Label all valves with valve tag, provide valve schedule in mechanical room detailing each valve, valve location, valve function, normal position.
D. Provide pipe labeling minimum every 20’ and on every branch pipe. Label on both sides of any wall penetration.

3.2 PIPE INSTALLATION

A. Pipe Supports: Supports shall be spaced so weights are evenly distributed typically 6 feet to 10 feet apart unless otherwise indicated. Supports shall be positioned so that piping rests evenly on the base without undo strain.
B. Install in accordance with manufacturer's instructions, provide engineer with contractor hot work procedure prior to doing any hot work onsite.
C. Route piping parallel to structure, coordinate location with other trades prior to installation.

3.3 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 15250

MECHANICAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulation for the following applications:
   1. Pipes and accessories

1.2 REFERENCES

A. Independent Listing Agency References:
   1. Underwriters Laboratories (UL).
   2. International Code Council - Engineering Service (ICC-ES).
   3. Intertek Testing Service (ITS) - Label Mark is OPL.
B. Building Code References:
   1. 2022 International Mechanical Code (2012 IMC).
   2. 2021 Oregon Energy Efficiency Specialty Code
   3. 2023 Oregon Plumbing Specialty Code
   4. International Code Council (ICC).

1.3 SYSTEM

A. Work of this section includes labor, material, methods, and equipment to insulate the piping systems scheduled or indicated.

1.4 SUBMITTALS

A. Product data: To include product description, manufacturer's installation instructions, types and recommended thicknesses for each application, and location of materials.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Submit UL and/or Intertek Testing Service (ITS) Listings.
   2. Insulation jackets.
   3. Preparation instructions and recommendations.
   4. Storage and handling requirements and recommendations.
   5. Installation methods.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years experience manufacturing similar products.
B. Installer Qualifications: Minimum 2 years experience installing similar

products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Deliver materials in original sealed packages, clearly labeled with manufacturing information, including product identification and manufacturing lot numbers.
C. Store material out of weather and away from incidental damage.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 Closed-cell Elastomeric pipe insulation:

A. Insulation materials shall have a closed cell structure to prevent moisture intrusion.
B. Insulation materials shall be manufactured without the use of CFC’, HFC’s or HCFC’s. Will be formaldehyde free, low VOC’s and treated to resists mold and mildew.
C. Insulation shall of a maximum thermal conductivity of 0.27 Btu-in/hr-sqft, tested in accordance with ASTM c 177 or ASTM C 518.
D. Insulation shall have a flame-spread index meeting the AHJ, or less than 25 and a smoke-developed index of less than 50 as tested in accordance with ASTM E 84.
E All liquid, heat reclaim and suction lines shall be insulated continuously with a minimum of 3/4” wall thickness.
F. Approved Product:
    1. Armacell or approved.

2.2 Cover Jackets

A. Field-Applied Jackets or Fitting Covers
    1. Exterior 20 mil UV-resistant fittings, jacketing and accessories, white. Fitting cover system shall consist of pre-molded, high-impact PVC materials.
B. Manufacturer: Ceelco or approved

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that all piping is tested and approved prior to insulation installation.
B. Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.
C . Do not insulate over name plates, valve actuators.

3.2 INSTALLATION

A. All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be installed in strict accordance with manufacturer's recommendations, building codes, and industry standards.
B. Pipe insulation is to be continuous, insulation to cover all valve bodies and fittings. Insulation to be installed under pipe hangers not over, provide metal shields to protect insulation at hangers.
C. Install insulation with materials made by the same manufacture, install in strict conformance with the manufacturer's installation requirements.
D. All refrigerant piping to be insulated and protected with cover jacket.

3.3 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 15700

HVAC EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. HVAC equipment including the following:
1. Air Handling Unit
2. Condensing Unit
3. Fan Powered VAV Boxes

1.2 RELATED SECTIONS

A. General Conditions , Division 16 Supplementary Conditions and Contract Drawings.

1.3 REFERENCES

A. The American Society of Mechanical Engineers (ASME) (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, General Conditions - Rules for Construction of Pressure Vessels.
B. Food and Drug Administration (FDA).
C. American National Standards Institute (ANSI).
D. American Society for Testing and Materials (ASTM):
1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM C1045 - Standard Practice for Calculating Thermal Transmission Properties Under Steady-State Conditions.
E. American Water Works Association (AWWA)
F. National Electrical Manufacturers Association (NEMA) MG-1 - Motors and Generators.
G. National Electrical Manufacturers Association (NEMA) 56C - Frame Sizes and Configurations.
H. Underwriters Laboratory (UL).

1.4 SUBMITTALS

A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions:
1. Provide complete literature for all components of packaged equipment. These include performance, heat exchanger

calculations, data for all accessories and valves and complete wiring diagrams specific to the exact unit to be supplied. The wiring diagram shall indicate all required field and factory wiring.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
5. Equipment shown on schedules.
6. Controls.

B. Seismic calculations from Oregon State Licensed Professional Engineer for all equipment and ducts required by AHJ.
C. Project Record Documents: Record actual locations of flow controls.
D. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
B. Installer Qualifications: Minimum 2 years experience installing similar systems.
C. Product Qualifications:
1. Where items of equipment are required to be provided with compliance to U.L., A.G.A., or other testing and approving agencies, the Contractor may submit a written certification from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the item of equipment has been tested and conforms to the same method of test as the listed agency would conduct.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
1. Accept equipment on site in shipping containers with labeling in place. Inspect for damage.
2. Provide temporary end caps and closures on duct work, piping and fittings. Maintain in place until installation.
3. Protect piping and duct work components from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. The contractor shall guarantee system operation for one full heating season and one full cooling season, to the extent that the HVAC system shall deliver the heating and cooling capacities as specified.

PART 2 PRODUCTS

2.01 Air Handler

A. Manufactures:
1. See schedule on plans
2. Alternate manufacturers by substitution request.
   i. Note the requirement for the unit to fit through the existing doorways or the existing osa louver.

2.02 CONDENSING UNIT

A. Manufactures:
1. See schedule on plans
2. Alternate manufacturers by substitution request.
   a. Note facility currently utilizes Aaon condensing units in several areas.

2.03 Fan Powered VAV Boxes

A. Manufactures:
1. See schedule on plans.
2. Alternate manufacturers by substitution request.
   a. Note sound levels to not exceed specified equipment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until controls have been installed on Fan Powered VAV Boxes.
B. Do not begin installation until ALC control communication wiring, control panels, and sensor wiring has been installed.

3.2 INSTALLATION

A. Mechanical Equipment.

1. Install in strict conformance to manufacturer's installation requirements. Notify engineer of any conflicts between manufacturer's installation requirements and Contract Documents prior to installation.
2. Contractor responsible for providing all service access requirements and meeting all code access requirements. Maintain clearances free from all ducts, piping and electrical.
3. Contractor to provide seismic calculations required by the AHJ by Oregon licensed engineer. Provide all mounting hardware and any inspections required.

3.3 START UP

A. Provide factory startup on Air Handling Unit and Condensing Unit. Factory start up and testing of the Condensing Unit shall happen with the control contractor and Air Handling Unit representatives on site. Complete all factory startup forms and warranty forms. Provide documentation in O&M manuals.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 15800

HVAC DUCTS AND ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Ductwork and accessories for HVAC including the following:
   1. Supply air, return air, outside air, exhaust, make-up air, and relief systems.
   2. Drawings are diagrammatic only, to show general location of duct work, equipment and accessories. Coordinate location of all duct work with other trades prior to rough in. Provide necessary offsets or transitions as required to install the system in the space provided. Do not cut or notch any framing member without prior written approval from structural engineer.
   3. The Contractor shall be responsible for providing a joint and cooperative effort to coordinate the test and balance as specified in Section 15990, “Balancing of Air Systems”

B. Definitions:
   1. SMACNA Standards as used in this specification means the HVAC Duct Construction Standards, Metal and Flexible.
   2. Seal or Sealing: Use of liquid or mastic sealant, with or without compatible tape overlay, or gasketing of flanged joints, to keep air leakage at duct joints, seams and connections to an acceptable minimum.
   3. Duct Pressure Classification: SMACNA HVAC Duct Construction Standards, Metal and Flexible.
   4. Exposed Duct: Exposed to view in a finished room or exposed to weather.

1.2 RELATED WORK

A. General Mechanical Requirements: Section 15010.
B. Testing and Balancing of Air Flows: Section 15990, Balancing of Air Systems

1.3 QUALITY ASSURANCE

A. Duct System Construction and Installation: Referenced SMACNA Standards are the minimum acceptable quality.
B. Duct Sealing, Air Leakage Criteria, and Air Leakage Tests: Ducts shall be sealed as per duct sealing requirements of SMACNA HVAC Air Duct Leakage Test Manual.
C. Duct accessories exposed to the air stream, such as dampers of all types (except smoke dampers) and access openings, shall be of the same material as the duct or provide at least the same level of corrosion resistance.

1.4 SUBMITTALS

A. Submit in accordance with , SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
B. Manufacturer's Literature and Data:
   1. Rectangular ducts:
      a. Schedules of duct systems, materials and selected SMACNA construction alternatives for joints, sealing, gage and reinforcement.
      b. Duct liner.
      c. Sealants and gaskets.
      d. Access doors.
   2. Round duct construction details:
      a. Manufacturer's details for duct fittings.
      b. Duct liner.
      c. Sealants and gaskets.
      d. Access sections.
      e. Installation instructions.
   3. Volume dampers.
   4. Upper hanger attachments. Oregon State Structural Engineers stamped calculations for seismic restraints.
   5. Flexible ducts and clamps, with manufacturer's installation instructions.
   6. Flexible connections.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
B. American Society for Testing and Materials (ASTM):

A653-09	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy coated (Galvannealed) by the Hot-Dip process
A1011-09a	Standard Specification for Steel, Sheet and Strip, Hot rolled, Carbon, structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength
C1071-05e1	Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
E84-09a	Standard Test Method for Surface Burning Characteristics of Building Materials

C. National Fire Protection Association (NFPA):

90A-09	Standard for the Installation of Air Conditioning and Ventilating Systems
96-08	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
   2nd Edition – 2005.....HVAC Duct Construction Standards, Metal and Flexible
   1st Edition - 1985.....HVAC Air Duct Leakage Test Manual
   6th Edition – 2003.....Fibrous Glass Duct Construction Standards
E. Underwriters Laboratories, Inc. (UL):
   181-08 .....Factory-Made Air Ducts and Air Connectors
   555-06 .....Standard for Fire Dampers
   555S-06 .....Standard for Smoke Dampers

PART 2 - PRODUCTS

2.1 DUCT MATERIALS AND SEALANTS

A. General: Except for systems specified otherwise, construct ducts, casings, and accessories of galvanized sheet steel, ASTM A653, coating G90; or, aluminum sheet, ASTM B209, alloy 1100, 3003 or 5052.
B. Specified Corrosion Resistant Systems: Stainless steel sheet, ASTM A167, Class 302 or 304, Condition A (annealed) Finish No. 4 for exposed ducts and Finish No. 2B for concealed duct or ducts located in mechanical rooms.
C. Joint Sealing: Refer to SMACNA HVAC Duct Construction Standards, paragraph S1.9.
   1. Sealant: Elastomeric compound, gun or brush grade, maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork as recommended by the manufacturer. Generally provide liquid sealant, with or without compatible tape, for low clearance slip joints and heavy, permanently elastic, mastic type where clearances are larger. Oil base caulking and glazing compounds are not acceptable because they do not retain elasticity and bond.
   2. Gaskets in Flanged Joints: Soft neoprene.
   3. Aluminum foil type tape.
      a. 2 mil dead soft, pressure adhesive.
      b. 2-1/2" width.
      c. Nashua 324A or approved.

2.2 DUCT CONSTRUCTION AND INSTALLATION

A. Constructed as outlined in the SMACNA and ASHRAE Standards, for the following pressure classifications or as designated on drawings.
   1. Ductwork from the supply air fan to the terminal velocity reduction device (VAV box) or zone-tempering coil shall be fabricated to meet minimum 4" w.g. internal pressure.
   2. Ductwork from downstream of terminal velocity reduction device (VAV box) or zone tempering coil shall be fabricated to meet minimum 2" w.g. internal pressure.
   3. Return air ductwork shall be fabricated to meet minimum 2" w.g. internal pressure.

B. Provide state of Oregon Structural Engineers Stamp on any duct work requiring seismic calculations.
C. Seal per SMACNA and ASHRAE essentially air tight, with methods approved in these specifications.
D. Round Ducts: Furnish duct and fittings made by the same manufacturer to insure good fit of slip joints.
    1. Elbows: Diameters 80 through 200 mm (3 through 8 inches) shall be two sections die stamped, all others shall be gored construction, maximum 18 degree angle, with all seams continuously welded or standing seam. Coat galvanized areas of fittings damaged by welding with corrosion resistant aluminum paint or galvanized repair compound.
    2. Provide bell mouth, conical tees or taps, laterals, reducers, and other low loss fittings as shown in SMACNA HVAC Duct Construction Standards.
    3. Ribbed Duct Option: Lighter gage round/oval duct and fittings may be furnished provided certified tests indicating that the rigidity and performance is equivalent to SMACNA standard gage ducts are submitted.
        a. Ducts: Manufacturer's published standard gage, G90 coating, spiral lock seam construction with an intermediate standing rib.
        b. Fittings: May be manufacturer's standard as shown in published catalogs, fabricated by spot welding and bonding with neoprene base cement or machine formed seam in lieu of continuous welded seams.
    4. Provide flat side reinforcement of oval ducts as recommended by the manufacturer and SMACNA HVAC Duct Construction Standard S3.13. Because of high pressure loss, do not use internal tie-rod reinforcement unless approved by the Resident Engineer.
E. Volume Dampers: Single blade or opposed blade, multi-louver type as detailed in SMACNA Standards. Refer to SMACNA Detail Figure 2-12 for Single Blade and Figure 2.13 for Multi-blade Volume Dampers.
    1. Dampers shall have an external locking manual quadrant. On duct systems with external insulation, the quadrant shall be installed with a standoff bracket to clear the insulation. The quadrant shall have a wing nut for locking the damper in place and a scale for indicating the position of the damper. (A handle attached directly to the damper shaft is not acceptable).
    2. Round ducts: Factory made damper/sleeve. J&J JR307.
    3. Rectangular Ducts:
        a. Ducts 20" and less:
            1. Duro-Dyne 3/8" Quadline series KS-38.
        b. Ducts larger than 21":
            1. Duro-dyne 1/2" Quadline series KS-12
G. Duct Hangers and Supports: Refer to SMACNA Standards Section IV. Avoid use of trapeze hangers for round duct.

2.3 DUCT LINER

A. Duct sizes shown on drawings for lined duct are clear opening inside lining.

B. Duct liner is required to be used for all supply, return and relief ducts (within building envelope). Duct liner is not permitted for outside air ducts or exhaust air ducts (provide three inch exterior insulation with aluminum taped seams).
C. Rectangular Duct or Casing Liner: ASTM C1071, Type I (flexible), or Type II (board), one inch minimum thickness inside building insulated envelope, two inch outside building insulated envelope, applied with mechanical fasteners and 100 percent coverage of adhesive in conformance with SMACNA, Duct Liner Application Standard.

2.4 DUCT ACCESS DOORS, PANELS AND SECTIONS

A. Provide access doors, sized and located for maintenance work, upstream, in the following locations:
   1. Each duct mounted coil and humidifier.
   2. Each fire damper (for link service), smoke damper and automatic control damper.
   3. Each duct mounted smoke detector.
B. Openings shall be as large as feasible in small ducts, 12 inch by 12 inch minimum where possible. Access sections in insulated ducts shall be double-wall, insulated.
   1. For rectangular ducts: Refer to SMACNA HVAC Duct Construction Standards (Figure 2-12).
   2. For round and flat oval duct: Refer to SMACNA HVAC duct Construction Standards (Figure 2-11).

2.5 FLEXIBLE AIR DUCT

A. General: Factory fabricated, complying with NFPA 90A for connectors not passing through floors of buildings. Flexible ducts shall not penetrate any fire or smoke barrier which is required to have a fire resistance rating of one hour or more. Flexible duct length shall not exceed 5 feet. Provide insulated acoustical air duct connectors in supply air duct systems and elsewhere as shown.
B. Flexible ducts shall be listed by Underwriters Laboratories, Inc., complying with UL 181. Ducts larger than 8 inches in diameter shall be Class 1. Ducts 8 inches in diameter and smaller may be Class 1 or Class 2.
C. Insulated Flexible Air Duct: Factory made including mineral fiber insulation with maximum C factor of 0.25 at 75 degrees F mean temperature, encased with a low permeability moisture barrier outer jacket, having a puncture resistance of not less than 50 Beach Units. Acoustic insertion loss shall not be less than 3 dB per foot of straight duct, at 500 Hz, based on 6 inch duct, of 2500 fpm.
D. Application Criteria:
   1. Temperature range: -18 to 93 degrees C (0 to 200 degrees F) internal.
   2. Maximum working velocity: 4000 feet per minute.
   3. Minimum working pressure, inches of water gage: 2500 Pa (10 inches) positive, 500 Pa (2 inches) negative.
E. Duct Clamps: 100 percent nylon strap, 175 pounds minimum loop tensile strength manufactured for this purpose or stainless steel strap with cadmium

plated worm gear tightening device. Apply clamps with sealant and as approved for UL 181, Class 1 installation.

F. Owens Corning INL-125, ATCO or approved.

2.6 FLEXIBLE DUCT CONNECTIONS

A. Where duct connections are made to fans, air terminal unit (supply connection), and air handling units, install a non-combustible flexible connection of 29 ounce neoprene coated fabric approximately 6 inches wide. For connections exposed to sun and weather provide hypalon coating in lieu of neoprene. Burning characteristics shall conform to NFPA 90A. Securely fasten flexible connections to round ducts with stainless steel or zinc-coated iron draw bands with worm gear fastener. For rectangular connections, crimp fabric to sheet metal and fasten sheet metal to ducts by screws 2 inches on center. Fabric shall not be stressed other than by air pressure. Allow at least one inch slack to insure that no vibration is transmitted.

B. Manufactured by Duro Dyne Corporation, Bay Shore, N.Y. or approved.

2.7 FILTERS

A. Furnish and install filter racks as shown on the drawings. Follow manufacturer's directions for installing each type of filter. The filters shall be installed such that there will be no leakage around the filter banks. Filters in frame holders shall be provided with lift handles. Hinged access panels or doors shall be installed for convenient access to each filter section. Filter retainer frames shall be arranged to provide proper support to facilitate each filter fitting tightly in place with provision to seal properly. Provide reinforcement as required such that there is no more than two inches of deflection across the filter rack during operation. Clean filters shall be installed before Test and Balance is begun. Filters banks shall be located in a convenient and accessible place, locate so that access is not impeded by walls, equipment, ceiling grid, etc. Filters shall be of standard size, do not use odd size or special order size filters.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with provisions of Section 15010, particularly regarding coordination with other trades and work in existing buildings.

B. Fabricate and install ductwork and accessories in accordance with referenced SMACNA Standards:

1. Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, boxes, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid. Duct sizes on the drawings are inside dimensions which shall be altered by Contractor to other dimensions with the

same air handling characteristics where necessary to avoid interferences and clearance difficulties.

2. Provide duct transitions, offsets and connections to dampers, coils, and other equipment in accordance with SMACNA Standards, Section II. Provide streamliner, when an obstruction cannot be avoided and must be taken in by a duct. Repair galvanized areas with galvanizing repair compound.
3. Provide bolted construction and tie-rod reinforcement in accordance with SMACNA Standards.
4. Construct casings, eliminators, and pipe penetrations in accordance with SMACNA Standards, Chapter 6. Design casing access doors to swing against air pressure so that pressure helps to maintain a tight seal.

C. Install duct hangers and supports in accordance with SMACNA Standards, Chapter 4.
D. Flexible duct installation: Refer to SMACNA Standards, Chapter 3. Ducts shall be continuous, single pieces not over 5 feet long (NFPA 90A), as straight and short as feasible, adequately supported. Centerline radius of bends shall be not less than two duct diameters. Make connections with clamps as recommended by SMACNA. Clamp per SMACNA with one clamp on the core duct and one on the insulation jacket. Flexible ducts shall not penetrate floors, or any chase or partition designated as a fire or smoke barrier, including corridor partitions fire rated one hour or two hour. Support ducts SMACNA Standards.
E. Where diffusers, registers and grilles cannot be installed to avoid seeing inside the duct, paint the inside of the duct with flat black paint to reduce visibility.
F. Control Damper Installation:
   1. Provide Manual volume damper in every branch take off. Locate handle in an accessible location. Provide remote actuator or access door where damper is located above a hard lid ceiling, coordinate with owner’s representative.

I. Low Pressure Duct Liner: Install in accordance with SMACNA, Duct Liner Application Standard.
J. Protection and Cleaning: Adequately protect equipment and materials against physical damage. Place equipment in first class operating condition, or return to source of supply for repair or replacement, as determined by owner’s representative and Engineer. Protect equipment and ducts during construction against entry of foreign matter to the inside, contractor responsible for cleaning both inside and outside before operation and painting if not properly protected during construction. When new ducts are connected to existing ductwork, run system with filter media at the end of existing duct for minimum 8 hours at maximum airflow, remove filter media and attach new ductwork. When designated on drawings clean both new and existing ductwork by mopping and vacuum cleaning inside and outside before operation.

3.2 DUCT LEAKAGE TESTS AND REPAIR

A. Ductwork leakage testing shall be performed by the Testing and Balancing Contractor directly contracted by the General Contractor and independent of the Sheet Metal Contractor. Any ductwork concealed in inaccessible locations;

chases, above hard lid ceilings, attic spaces, etc. shall be tested, and any system or section of system designated on drawings.

B. Ductwork leakage testing shall be performed for the entire air distribution system (including all supply, return, exhaust and relief ductwork), section by section, including fans, coils and filter sections. Based upon satisfactory initial duct leakage test results, the scope of the testing may be reduced by the engineer on ductwork constructed to the 500 Pa (2" WG) duct pressure classification. In no case shall the leakage testing of ductwork constructed above the 500 Pa (2" WG) duct pressure classification or ductwork located in shafts or other inaccessible areas be eliminated.
C. Test procedure, apparatus and report shall conform to SMACNA Leakage Test manual. The maximum leakage rate allowed is 4 percent of the design air flow rate.
D. All ductwork shall be leak tested first before enclosed in a shaft or covered in other inaccessible areas.
E. All tests shall be performed in the presence of the owner’s representative and the Test and Balance agency. The Test and Balance agency shall measure and record duct leakage and report to the Resident Engineer and identify leakage source with excessive leakage.
F. If any portion of the duct system tested fails to meet the permissible leakage level, the Contractor shall rectify sealing of ductwork to bring it into compliance and shall retest it until acceptable leakage is demonstrated to the engineer.
G. All tests and necessary repairs shall be completed prior to insulation or concealment of ductwork.
H. Make sure all openings used for testing flow and temperatures by TAB Contractor are sealed properly.

END OF SECTION

SECTION 15900

DIRECT DIGITAL CONTROL SYSTEM

PART 1: GENERAL

RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents.
B. The following sections constitute related work:
    1. Section 15010 - Basic Mechanical Materials and Methods
    2. Section 15990 - Testing, Adjusting, and Balancing
    3. Section 16050 - Basic Electrical Materials and Methods

DESCRIPTION

A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers, a control system server, and a web-based operator interface. Integrated into to the Auto-mated Logic Control System located at the Marion County Jail.
B. System software shall be based on a server/thin client architecture, designed around the open standards of web technology. The control system server shall be accessed using a Web browser over the control system network, the owner's local area network, and (at the owner's discretion) over the Internet.
   The intent of the thin-client architecture is to provide operators complete access to the control system via a Web browser. No special software other than a web browser shall be required to access graphics, point displays, and trends, configure trends, configure points and controllers, or to download programming into the controllers.
C. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. I/O points, schedules, setpoints, trends and alarms specified in 15900 Appendix A shall be BACnet objects.

CONTROL SYSTEM HARDWARE

A. The contractor shall provide Automated Logic hardware to interface to the existing Marion County WebCTRL server.
B. The Contractor shall use only operator workstation software, controller software, custom application programming language, and controllers from the corresponding manufacturer.
C. Other products specified herein (such as sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

QUALITY ASSURANCE

A. Installer and Manufacturer Qualifications

1. Installer shall have an established working relationship with Control System Manufacturer.
2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.

CODES AND STANDARDS

A. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to the receipt of bids of the following codes:
   1. National Electric Code (NEC)
   2. International Building Code (IBC)
      a. Section 719 Ducts and Air Transfer Openings
      b. Section 907 Fire Alarm and Detection Systems
   3. ANSI/ASHRAE Standard 135, BACnet - A Data Communication Protocol for Building Automation and Control Systems

SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).
   1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.
   2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec.and shall automatically refresh every 15 sec.
   3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
   4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
   5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 sec.
   6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
   7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
   8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.
   9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.

10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Table-1
Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5ºC (±1ºF)
Ducted Air	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Delta-T	±0.15º (±0.25ºF)
Relative Humidity	±5% RH
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Carbon Dioxide (CO2)	±50 ppm

Note 1: Accuracy applies to 10%–100% of scale
Note 2: For both absolute and differential pressure
Note 3: Not including utility-supplied meters

Table 2
Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0–1.5 kPa (0–6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0ºC (±2.0ºF)	
Duct Temperature	±1.5ºC (±3ºF)	

SUBMITTALS

A. Product Data and Shop Drawings: Meet requirements of Section 01 on Shop Drawings, Product Data, and Samples. In addition, the contractor shall provide shop drawings or other submittals on hardware, software, and equipment to be installed or provided. No work may begin on any segment of this project until submittals have been approved for conformity with design intent. Provide drawings as AutoCAD 2006 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and three 11” x 17” prints of each drawing. When manufacturer’s cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawing shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient

quantities to complete work. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:

1. DDC System Hardware
    a. A complete bill of materials to be used indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
    b. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
        i. Direct digital controllers (controller panels)
        ii. Transducers and transmitters
        iii. Sensors (including accuracy data)
        iv. Actuators
        v. Valves
        vi. Relays and switches
        vii. Control panels
        viii. Power supplies
        ix. Batteries
        x. Operator interface equipment
        xi. Wiring
    c. Wiring diagrams and layouts for each control panel. Show termination numbers.
    d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware. Riser diagrams showing control network layout, communication protocol, and wire types.
2. Central System Hardware and Software
    a. A complete bill of material of equipment used indicating quantity, manufacturer, model number, and relevant technical.
    b. Manufacturer's description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:
        i. Interface equipment between CPU or server and control panels
        ii. Operating System software
        iii. Operator interface software
        iv. Color graphic software
        v. Third-party software
    c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show interface wiring to control system.
    d. Network riser diagrams of wiring between central control unit and control panels.
3. Controlled Systems
    a. Riser diagrams showing control network layout, communication protocol, and wire types.

b. A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
c. A schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
d. An instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
e. A mounting, wiring, and routing plan-view drawing. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
f. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
g. A point list for each control system. List I/O points and software points specified in Section 15900 Appendix A. Indicate alarmed and trended points.

4. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.
5. Description of process, report formats, and checklists to be used in Section 15900 Article 3.17 (Control System Demonstration and Acceptance).
6. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.

B. Schedules
1. Within one month of contract award, provide a schedule of the work indicating the following:
a. Intended sequence of work items
b. Start date of each work item
c. Duration of each work item
d. Planned delivery dates for ordered material and equipment and expected lead times
e. Milestones indicating possible restraints on work by other trades or situations
2. Weekly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.

C. Project Record Documents. Upon completion of installation, submit three copies of record (as-built) documents of the documents shall be submitted for approval prior to final completion and shall include:
1. Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD 2006 (or newer) compatible files on magnetic or optical media (file format: .DWG, .DXF, .VSD, or comparable) and as 11" x 17" prints.

2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Section 15900 Article 3.17 (Control System Demonstration and Acceptance).
3. Operation and Maintenance (O&M) Manual.
4. As-built versions of submittal product data.
5. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
6. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
7. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
8. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
9. Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.
10. Graphic files, programs, and database on magnetic or optical media.
11. List of recommended spare parts with part numbers and suppliers.
12. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
13. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.
14. Licenses, guarantees, and warranty documents for equipment and systems.
15. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

D. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished via instructor-led sessions, computer-based training, or web-based training. Engineer will modify course outlines and materials if necessary to meet Owner's needs. Engineer will review and approve course outlines and materials at least three weeks before first class.

WARRANTY

A. Warrant work as follows:
   1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.

2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
3. If the engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, the engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.
4. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve the contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner’s written authorization.
5. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer’s acceptance.

OWNERSHIP OF PROPRIETARY MATERIAL

A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
    1. Graphics
    2. Record drawings
    3. Database
    4. Application programming code
    5. Documentation

PART 2: PRODUCTS

2.1 MATERIALS

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

COMMUNICATION

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.
B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
    1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
    2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Section 15900 Appendix A. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.
E. Workstations, Building Control Panels, and Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight saving and standard time as applicable.
F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.
G. System shall support Web services data exchange with any other system that complies with XML (extensible markup language) and SOAP (simple object access protocol) standards specified by the Web Services Interoperability Organization(WS-I) Basic Profile 1.0 or higher. Web services support shall as a minimum be provided at the workstation or web server level and shall enable data to be read from or written to the system.
    1. System shall support Web services read data requests by retrieving requested trend data or point values (I/O hardware points, analog value software points, or binary value software points) from any system controller or from the trend history database.
    2. System shall support Web services write data request to each analog and binary object that can be edited through the system operator interface by downloading a numeric value to the specified object.
    3. For read or write requests, the system shall require user name and password authentication and shall support SSL (Secure Socket Layer) or equivalent data encryption.
    4. System shall support discovery through a Web services connection or shall provide a tool available through the Operator Interface that will reveal the path/identifier needed to allow a third party Web services device to read data from or write data to any object in the system which supports this service.

CONTROLLER SOFTWARE

A. Furnish the following applications for building and energy management. All software application shall reside and operate in the system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.

B. Scheduling. Provide the capability to execute control functions according to a user created or edited schedule. Each schedule shall provide the following schedule options as a minimum:
   1. Weekly Schedule. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).
   2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule has executed, the system shall discard and replace the exception schedule with the standard schedule for that day of the week.
   3. Holiday Schedules. Provide the capability for the operator to define up to 24 special or holiday schedules. These schedules will be repeated each year. The operator shall be able to define the length of each holiday period.
C. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.
D. Binary Alarms. Each binary object shall have the capability to be configured to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
E. Analog Alarms. Each analog object shall have both high and low alarm limits. The operator shall be able to enable or disable these alarms.
F. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display on graphics.
G. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.
H. Maintenance Management. The system shall be capable of generating maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits. Configure and enable maintenance alarms as specified in Section 15900 Appendix A (Sequences of Operation).
I. Sequencing. Application software shall sequence air handlers, fan powered boxes, condensors.
J. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs. The calculation interval, PID gains, and other tuning parameters shall be adjustable by a user with the correct security level.
K. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.
L. Anti-Short Cycling. All binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

M. On and Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and a setpoint. The algorithm shall be direct-acting or reverse-acting.
N. Runtime Totalization. Provide software to totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified in Section 15900 Appendix A (Sequence of Operations).

CONTROLLERS

A. Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in Section 15900. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.
B. BACnet.
    1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
    2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
    3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
    4. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.
    5. BACnet Communication.
        a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
        b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
        c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
        d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
        e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication
   1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
   2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
   3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
   4. Stand-Alone Operation. Each piece of equipment specified in Section 15900 Appendix A shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.

D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.
   1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
   2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

E. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.

F. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

G. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to a field-removable modular terminal strip or to a termination card connected by a ribbon cable. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

H. Memory.
   1. Controller memory shall support operating system, database, and programming requirements.
   2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.

3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

I. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

J. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

INPUT AND OUTPUT INTERFACE

A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

B. Protection. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground shall cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no controller damage.

C. Binary Inputs. Binary inputs shall allow the monitoring of ON/OFF signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall also accumulate up to 10 pulses per second.

E. Analog Inputs. Analog inputs shall monitor low-voltage (0–10 Vdc), current (4–20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs. Binary outputs shall provide for ON/OFF operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on Building Controllers shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

G. Analog Outputs. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0–10 Vdc or a 4–20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

I. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system

POWER SUPPLIES AND LINE FILTERING

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
   1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.
      a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
      b. Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering.
   1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:
      a. Dielectric strength of 1000 V minimum
      b. Response time of 10 nanoseconds or less
      c. Transverse mode noise attenuation of 65 dB or greater
      d. Common mode noise attenuation of 150 dB or greater at 40–100 Hz

AUXILIARY CONTROL DEVICES

A. Motorized Control Dampers, unless otherwise specified elsewhere, shall be as follow.
   1. Type. Control dampers shall be the parallel or opposed-blade type as specified below or as scheduled on drawings.
      a. Outdoor and return air mixing dampers and face-and-bypass dampers shall be parallel-blade and shall direct airstreams toward each other.
      b. Other modulating dampers shall be opposed-blade.
      c. Two-position shutoff dampers shall be parallel- or opposed-blade with blade and side seals.
   2. Frame. Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or 3.175 mm (⅛ in.) extruded aluminum with reinforced corner bracing.
   3. Blades. Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm]) performance. Blades shall be not less than 1.5875 mm (16 gauge).
   4. Shaft Bearings. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.
   5. Seals. Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 50 L/s·m^2(10 cfm per ft^2) at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 7.5 m/s (1500 fpm).

6. Sections. Individual damper sections shall not exceed 125 cm × 150 cm (48 in. × 60 in.). Each section shall have at least one damper actuator.
7. Modulating dampers shall provide a linear flow characteristic where possible.
8. Linkages. Dampers shall have exposed linkages.

B. Electric Damper and Valve Actuators.
1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.
2. Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).
3. Signal and Range. Proportional actuators shall accept a 0–10 Vdc or a 0–20 mA control signal and shall have a 2–10 Vdc or 4–20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)
4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
5. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

C. Temperature Sensors.
1. Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
2. Duct Sensors. Duct sensors shall be averaging. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m^2(10 ft^2) of duct cross-section.
3. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.
4. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port.
5. Differential Sensors. Provide matched sensors for differential temperature measurement.

D. Relays.
1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

E. Override Timers.
1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0–6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

F. Voltage Transformers.

1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4°C–55°C (40°F–130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

G. Current Switches.
1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

H. Pressure Transducers.
1. Transducers shall have linear output signal and field-adjustable zero and span.
2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.

I. Differential Pressure Switches. Differential pressure switches shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

J. Local Control Panels.
1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable subpanels. A single key shall be common to all field panels and subpanels.
2. Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
3. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.

WIRING AND RACEWAYS

A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 16.

B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

PART 3: EXECUTION

3.1 EXAMINATION

A. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.

B. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the contractor to report such discrepancies shall be made by—and at the expense of—this contractor.

3.2 PROTECTION

A. The contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.
B. The contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The contractor shall protect any material that is not immediately installed. The contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 COORDINATION

A. Site
    1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
    2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.
B. Submittals. See Section 15900 Article 1.10 (Submittals).
C. Test and Balance.
    1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
    2. The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.
    3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
    4. The tools used during the test and balance process will be returned at the completion of the testing and balancing.
D. Life Safety.
    1. Duct smoke detectors required for air handler shutdown. Interlock smoke detectors to air handlers for shutdown as specified in Section 15900 Appendix A (Sequences of Operation).
E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:

1. All communication media and equipment shall be provided as specified in Section 15900.
2. Each supplier of a controls product is responsible for the configuration, programming, start up, and testing of that product to meet the sequences of operation described in Section 15900 Appendix A.
3. The contractor shall coordinate and resolve any incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.
4. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
5. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.4 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
C. Install equipment in readily accessible locations as defined by Chapter 1 Article 100 Part A of the National Electrical Code (NEC).
D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
E. All equipment, installation, and wiring shall comply with industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.5 FIELD QUALITY CONTROL

A. All work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in Section 15900.
B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.
C. Contractor shall have work inspection by local and/or state authorities having jurisdiction over the work.

3.6 EXISTING EQUIPMENT

A. Wiring. The contractor may reuse any abandoned wires. The integrity of the wire and its proper application to the installation are the responsibility of the contractor. The wire shall be properly identified and tested in accordance with this specification. Unused or redundant wiring must be removed from site unless directed to abandon in place.
B. Local Control Panels. The contractor may reuse any existing local control panel to locate new equipment. All redundant equipment within these panels must be removed. Panel face cover must be patched to fill all holes caused by removal of unused equipment or replaced with new.

C. Repair. Unless otherwise directed, the contractor is not responsible for repair or replacement of existing energy equipment and systems, valves (all hydronic valves to be replaced per bid documents), dampers, or actuators (all fan powered boxes damper actuators to be replaced). Contractor to lubricate and exercise all dampers and valves through full range of operation, prior to connecting new controls. Should the contractor find existing equipment that requires repair, the engineer is to be notified immediately. Contractor responsible for replacement of any existing damper, valve or actuator not compatible with new control system.
D. Room Thermostats. Room thermostats to be replaced with Automated Logic thermostats with CO2 sensor. Patch and finish holes and marks left by removal to match existing walls.
E. Existing System Operating Schedule. The mechanical system must remain in operation and shall maintain space comfort during business hours (8:00 am to 5:00 pm, Monday through Friday). No modifications to the system shall cause mechanical system to be shut down for more than 15 minutes or to fail to maintain space comfort conditions during any such period. Perform cut-over of controls that cannot meet these conditions outside of operational hours.
F. The scheduling of fans through existing or temporary time clocks or control system shall be maintained throughout the DDC system installation
G. Modify existing starter control circuits, if necessary, to provide hand-off-auto control of each controlled starter. If new starters or starter control packages are required, these shall be included as part of this contract.
H. Patch holes and finish to match existing walls.

3.7 WIRING

A. All control and interlock wiring shall comply with national and local electrical codes, and Division 16 of this specification, Where the requirements of this section differ from Division 16, the requirements of this section shall take precedence.
B. All NEC Class 1 (line voltage) wiring shall be UL listed in conduit according to NEC and Division 16 requirements.
C. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be subfused when required to meet Class 2 current limit.
D. Where NEC Class 2 (current-limited) wires are in accessibly concealed locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL listed for the intended application.
E. All wiring in mechanical, electrical, or service rooms – or where subject to mechanical damage – shall be installed in conduit.
F. Do not install Class 2 wiring in raceways containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).
G. Do not install wiring in raceway containing tubing.
H. Where Class 2 wiring is run without conduit, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals. Clearly labeled every 6 m (20 ft).
I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.

J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.
K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.
M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.
N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.
O. Size of raceway and size and type of wire type shall be the responsibility of the contractor in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.
P. Include one pull string in each raceway 2.5 cm (1 in.) or larger.
Q. Use color-coded conductors throughout with conductors of different colors.
R. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.
S. Conceal all raceways except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g. steam pipes or flues).
T. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.
U. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of vertical raceways.
V. The contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
W. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.
X. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.8 COMMUNICATION WIRING

A. The contractor shall adhere to the items listed in the "Wiring" article in Part 3 of the specification.
B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling
C. Do not install communication wiring in raceways and enclosures containing Class 1 or other Class 2 wiring.

D. Maximum pulling, tension, and bend radius for the cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
E. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.
F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to manufacturer's instructions.
G. All runs of communication wiring shall be unspliced length when that length is commercially available.
H. All communication wiring shall be labeled to indicate origination and destination data.
I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."
J. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:
    1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
    2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.
    3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
    4. An MS/TP EIA-485 network shall have no T connections.

3.9 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.
B. Mount sensors rigidly and adequately for environment within which the sensor operates.
C. Room temperature sensors shall be installed on concealed junction boxes properly supported by wall framing.
D. All wires attached to sensors shall be sealed in their raceways or in the wall to stop air transmitted from other areas from affecting sensor readings.
E. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.
F. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m^2(1 ft^2) of coil area.
G. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.
H. Differential Air Static Pressure.
    1. Supply Duct Static Pressure. Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the height-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.

2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.
3. Building Static Pressure. Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
4. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
5. All air differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shut-off valves installed before the tee.

I. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.

3.10 ACTUATORS

A. General. Mount and link control damper actuators according to manufacturer's instructions.
1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
3. Provide all mounting hardware and linkages for actuator installation.

B. Electric/Electronic
1. Dampers: Actuators shall be direct mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° travel available for tightening the damper seal. Actuators shall be mounted following manufacturer’s recommendations.
2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.11 WARNING LABELS

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the control system.
1. Labels shall use white lettering (12-point type or larger) on a red background.
2. Warning labels shall read as follows.

C A U T I O N
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Permanent warning labels shall be affixed to all motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.
   1. Labels shall use white lettering (12-point type or larger) on a red background.
   2. Warning labels shall read as follows.

C A U T I O N
This equipment is fed from more than one power source with separate disconnects.
Disconnect all power sources before servicing.

3.12 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with control system address or termination number.
B. Permanently label or code each point of field terminal strips to show the instrument or item served. Label wires at the termination of controllers. Printed on heat shrink labels slid over wire. Do not shrink the labels, leave unheated so I/O identification is legible. Bradley PermaSleeve Heat Shrink Wire and Cable labels or approved.
C. Identify control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.
D. Identify all other control components with permanent labels. All plug-in components shall be labeled such that label removal of the component does not remove the label.
E. Identify room sensors related to terminal boxes or valves with nameplates.
F. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.
G. Identifiers shall match record documents.

3.13 CONTROLLERS

A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.
B. Building Controllers and Custom Application Controllers shall be selected to provide the required I/O point capacity required to monitor all of the hardware points listed in 15900 Appendix A (Sequences of Operation).

3.14 PROGRAMMING

A. Provide sufficient internal memory for the specified sequences of operation and trend logging.
B. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. See Section 15900 Appendix A (Sequences of Operation). Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.
C. Software Programming.

1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the contractor. Embed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:
    a. Text-based:
        i. Must provide actions for all possible situations
        ii. Must be modular and structured
        iii. Must be commented
    b. Graphic-based:
        i. Must provide actions for all possible situations
        ii. Must be documented
    c. Parameter-based:
        i. Must provide actions for all possible situations
        ii. Must be documented.

D. Operator Interface.
1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as setpoints. As a minimum, show on each equipment graphic the input and output points and relevant calculated points as indicated on the applicable Points List in Section 15900 Appendix A.
2. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.15 CONTROL SYSTEM CHECKOUT AND TESTING

A. Startup Testing. All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner’s representative is notified of the system demonstration.
1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers’ recommendations.

4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
6. Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops.
7. Alarms and Interlocks:
    a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
    c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action

3.16 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration.
1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" article in Part 3 of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
3. The demonstration process shall follow that approved in Part 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The contractor shall provide at least two persons equipped with two-way communication and shall be prepared to demonstrate actual field operation of a random selection of control and sensing points for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of the system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.
5. As each control input and output is checked, a log shall be completed showing the date, technician’s initials, and any corrective action taken or needed.
6. Demonstrate compliance with Part 1, "System Performance."

7. Demonstrate compliance with sequences of operation through all modes of operation.
8. Demonstrate complete operation of operator interface.
9. Additionally, the following items shall be demonstrated:
    a. DDC loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
    b. Demand limiting. The contractor shall supply a trend data output showing the action of the demand limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.
    c. Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of-value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
    d. Interface to the building fire alarm system.
    e. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.
10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance.
1. All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.
2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, "Submittals."

3.17 CLEANING

A. The contractor shall clean up all debris resulting from his/her activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their

contents have been removed. Waste shall be collected and placed in a designated location.

B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.18 DUCT SMOKE DETECTION

A. Submit data for coordination of duct smoke detector interface to HVAC systems as required in Part 1, "Submittals."
B. This Contractor shall provide a dry-contact alarm output in the same room as the HVAC equipment to be controlled.

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PART 4: APPENDIX

APPENDIX A:

Minimum points list:

Air Handling Unit:

Inputs:
- Mixed Air Temperature
- Freeze Stat Low Temperature
- Return Air Temperature
- Supply Fan Status
- Return Fan Status
- OSA Humidity
- OSA Temperature
- Dirty Filter
- Supply Air Temperature
- Supply Air Smoke Detector
- Return Air Smoke Detector
- Duct Static Pressure
- Outside Pressure
- Lobby Pressure
- Return Duct Static Pressure

Outputs:

- Supply Fan start/stop
- Return Fan start/stop
- Supply Fan VFD signal
- Return Fan VFD Signal
- Heating Valve
- Cooling Circuit 1 on/off
- Cooling Circuit 1 Speed (variable speed compressor)
- Cooling Circuit 2 on/off
- Cooling Circuit 2 Speed (variable speed compressor)
- OSA Damper
- Return Air Damper
- Relief Air Damper (In air handler)
- Remote relief dampers (typical 2 locations, see plans)

Fan Powered VAV Boxes:

Inputs:

- Room Temperature
- Room CO2
- Proof of Air Flow
- Discharge Air Temperature
- Fan Status
- Supply air temperature
- Return air temperature

Outputs:

- Heating Valve
- Fan on/off/speed
- Inlet damper position

Hydronic convectors:

Inputs:

Zone temperature sensor

Outputs:

Heating valve

Hydronic Unit Heater:

Inputs:

Zone temperature sensor

Fan Status

Outputs:

Fan on/off control

Exhaust Fans:

Inputs:

Fan Status

Outputs:

Fan on/off control

Sequence Of Operation: Sequence of Operation to match sequence for air handler G1, modify as required for specific locations. Sequence below is from “Marion County Jail F&G Project” Submittals for reference.

I. General Sequences – Applies to All Systems

Adjustable Parameters

All numeric values in the Sequence of Operation are adjustable parameters that can be modified without program changes or re-downloading that would interrupt system operation.

Power Loss to Control Modules

All control modules are equipped with battery backup and will retain programming, including time of day,

upon loss of power. On return of power control functions will return to normal operation based on scheduling and time of day with no operator interface. Delay on start parameters can be setup at random intervals to prevent demand surges on restart.

Power Loss to Server

On loss of power to the server only the EMCS will continue to run as normal. The EMCS human interface software, WebCTRL, is a network service and will automatically restart and connect to the system when power is restored.

Trends

Trending is available, by default, on any BACnet I/O point. Trends can also be added for any digital or analog value as well as any logical value in the graphical program, e.g. a PID output could be trended. Trending will be setup for all significant I/O points. Analog values will be set to log every 5 minutes and store 288 data points for live retrieval. Binary points will be set to trend on Change of Value (COV) and to store 100 COV trend samples live. Sample frequency and quantity of stored data are adjustable within the memory limits of each module. e.g. Trends can set to be logged every 5 minutes with 288 trend points allocated so that the live display will show 24 hours of trend data.

Trends are stored in module memory. Extended trending is available by archiving trends using Trend Historian for server storage.

Schedules

Occupancy schedules will initiate from the zone level. Air handling units, chillers, boilers, pumps etc. whose operation is intended to provide air or water flow to zones will function based on Run Requests, Cooling Requests or Heating Requests from the zones they serve. These central systems will not have separate scheduling capability.

Schedules can be set for all systems in a customer database, or for a single building, a single floor, or for an individual zone. Additionally, groups of equipment can be assembled in Schedule Groups for single entry scheduling of multiple zones for specific functions. For example, a Gym Activities Group could be used for single entry scheduling for practices, ball games etc. Another example would be a group of rooms occupied by a single tenant who has frequent need for space conditioning during otherwise unoccupied times.

Schedules can be set for weekly reoccurring occupancy, dated weekly, date, date range, wildcard or continuous and can be set for multiple years in advance.

Timed Local Override (TLO), if available from the local sensor, will override unoccupied schedule, placing equipment in occupied operation for the programmed time period. TLO can be programmed for fixed duration, e.g. 180 minutes, or for time durations that accumulate with each push or pulse of the override button, e.g. 30 minutes per pulse with 180 minutes maximum override. The second option is the default standard.

Unoccupied Operation

Whenever system operation is required to maintain low or high temperature limits during unoccupied hours of operation, PID control of heating and cooling functions will be bypassed and systems will go to 100% operation until setpoint is satisfied. HW or CHW valves, or VAV dampers will drive to their full open

position until setpoint is met.

Capability will be in the software to set an On/Off differential greater than occupied differential to reduce the frequency of unoccupied cycling, e.g. heating might be set to cycle on at 55 and remain on until 58°Fis reached.

Optimal Start

Zone start time will be adjusted based on indoor and outdoor temperatures so as to achieve occupied temperatures at the scheduled occupancy time. Optimal start can be adjusted by changing the capacitance values of each zone in the program. A learning adaptive feature can be enabled allowing the zone control to automatically adjust the capacitance to optimize start times. Both optimal start and learning can be disabled.

Outside Air Conditions

Outside air temperature will be monitored and averaged over a ten minute period. Alternate outside air temperature is available by default in programming and can be mapped to another site for backup or can

be left unused.
Outside air conditions can be mapped to any controller for use for local control sequencing.

Alarming

All alarms generated by WebCTRL may be setup for the following actions:
Alarm Popup
Print
Propagate To Server
Run External Program
Send Alphanumeric Page
Send E-Mail
Write to File
If the system has the Advanced Alarming package, WebCTRL can also perform the following alarm actions:
Send SNMP Trap
Write Property
Write to Database
All alarms may be enabled or disabled by the operator with out program change or memory download.
All alarms are set with default messages. Custom messages may be setup without program change or memory download. Not all available alarms are enabled except when requested or when it appears appropriate.

II. AHU-1 Sequence

General:

AHU-1 serves fan powered VAV TU boxes, and runs on command from zones.

Cooling / Heating Summary:

BAS Shall command cooling or heating to maintain current setpoint. On call for cooling, 1st stage of cooling operation shall be fan only, with economizer modulation to provide 60°F supply air. If Economizer cannot meet load at 100% outside air, condensing unit CU-1 will be enabled and compressors staged through internal controls to maintain supply air temperature setpoint (58°F – adjustable). Room or return air temperature transmitters enable or disable CU-1 and modulate the fan powered box heating coil control valves and outside air and return air dampers in sequence to maintain space temperature setpoints. Above 75°F outside, the outside air and return air dampers revert to the minimum outside air position. Freezestat mounted in supply duct disables supply fan when supply air temperature falls below 40°F.

Supply Fan Control

The supply fan will be continuously enabled whenever any zone is operating in an occupied mode and will cycle on zone demand for cooling to maintain unoccupied zone setpoints. If supply air flow from the AHU is required for unoccupied heating at the zones, the fan will cycle on demand for zone heating to maintain unoccupied zone heating setpoints.
Supply Fan VFD will modulate to maintain supply air static pressure setpoint.
Fan motor status will be monitored. If supply fan has been commanded to run by the BAS system and the fan status is not indicated, the BAS system will send an alarm to the operator workstation.

Supply Air Temperature Setpoint Reset

Occupied Mode
The following SA temperature reset sequences will be enabled when two or more zone send Occupied Run Requests to the AHU
SA Temperature Setpoint will be reset based on the zone cooling PIDs for all VAV zones served by that AHU
Initial SAT Setpoint will be 75°F to prevent economizer cooling.
When any zone’s cooling PID demand rises above 10% the SA setpoint will be reset to 68°F.
When any two zones reach 100% cooling demand the SAT setpoint will be reset down 1° F every five minutes. Minimum SA setpoint is 55° F.
When only one zone PID is at 100% the setpoint will be held at the last reset setpoint.
When all zone PIDs are below 100%, SA setpoint will be reset up 1° every five minutes until setpoint

reaches 68°.
If all zone PIDs fall below 10% SA setpoint will be reset to 75°.
The zone cooling demand percent will be requested no less than every 3 minutes
Unoccupied Mode
When all zones served the this AHU are unoccupied and a request for cooling is received from two or more zones SA cooling setpoint will be reset to 55°
When all zones served the this AHU are unoccupied and a request for heating is received from any non-fan powered VAV box SA heating setpoint will be reset to 90°.
Unoccupied Heating requests will take priority over cooling requests.

Supply Air Static Pressure Setpoint Reset

Static pressure setpoint will be established using trim and respond logic to increase or decrease setpoint input to a PI logic controller. The PI logic controller will modulate fan speed to maintain setpoint.
Initial static pressure setpoint will be 0.5" wc.
Maximum static pressure setpoint (P-Max) will be determined as follows
Set all FPB boxes to maximum occupied cfm.
Set all FPB boxes to maximum air flow.
Starting at 0.5" static pressure, adjust fan speed up until all boxes can maintain maximum occupied cfm.
The pressure required for all boxes to maintain maximum air flow will be P-Max.
Reset between 0.5” and P-Max will be as follows:
Whenever any 2 FPB boxes are 100% open, pressure setpoint will be increased by 0.05" wc every 5 minutes until the P-Max is met or only 1 FPB box is 100% open.
If only one FPB box is at 100% pressure setpoint reset will be stopped and setpoint will remain at current setpoint.
When all FPB boxes are reporting less than 100% open, the pressure setpoint will decrease by 0.05" every 5 minutes until setpoint is 0.5” or any individual FPB box again reaches 100% open.

Return Fan Control

During normal operation, return fan shall enable upon proof of supply fan run status
Return fan speed is controlled by a PID loop to maintain a return duct pressure setpoint (adj) that shall be determined in field by TAB contractor.

Economizer Control – Fixed Minimum Ventilation

Economizer consists of an outside air damper and a return air damper. 100% economizer = outside air damper open and return air damper closed. 0% economizer = outside air damper closed and return air damper open.
Economizer operation will initiate when Outside Air temperature falls to more than 4° below zone or return air temperature. Economizer will be disabled when OA is less than 1° below zone or RA temperature.
When economizer is initiated, SAT cooling PID control loop will modulate the economizer to maintain supply air set point.
When inactive the economizer will modulate to 0% position unless minimum OA position is required.
Minimum OA dampers position shall be set by the TAB contractor.
Supply air low limit will close outside air dampers and open return air dampers if SA falls below 42°F for 5 minutes.
If mixed air temperature falls below 36°F for more than 5 minutes OA dampers shall close and OA dampers open. If mixed air temperature remains below 36°F for an additional 5 minutes supply fan will stop. If the system has a HW coils the HW valve will open to 100%.

Cooling Control – Staged DX

Mechanical Cooling will be enabled when the following conditions exist:
Outside air temperature is greater than 62°F.
Supply fan is commanded on
Supply fan status is on
SA Temperature input to the cooling PI controller will stage compressors based on percentage output to meet cooling SA setpoint. A SAT bias of +- 3°F of setpoint will hold Pid to current value to prevent unnecessary cycling of DX. Bias disabled when Mechanical cooling is locked out)

When economizer cooling is unavailable compressors will stage as follows:
2 Stage Systems
1) First stage on at 40% and off at 5%
2) After 1st stage has been running for more than 5 minutes, Second stage will be on at 80% and off at 35%
Control contractor to modify staging of each cooling circuit to adjust for building reaction time.

Heating Control w/Hot Water

Heating will be activated whenever heat is required for morning warmup or to temper ventilation air when OA conditions and air flow quantities require heat.
When SA temperature falls below heating setpoint the heating PI control loop output will modulate the output to the HW valve between 0 and 100% as SA heating PID varies between 0 and 100%.
Heating will be locked out when outside air temperature is above 65°F.

Safeties

Following Safeties will be wired in series with fan contactors/starters to shut down the Supply Fan and when contact opening indicates an alarm condition.
Smoke detectors
Freeze Stat
An auxiliary contact will be wired to a BAS control module and will initiate the following:
1) Redundant fans shutdown
2) Close outside air dampers and open return air dampers
3) Open hot water valve 100%
Freeze stats require a manual reset at device as well as a software reset.
An alarm will be sent whenever the Freeze Stat trips.
Local Fire/Smoke Alarm
An auxiliary contact will be wired to BAS control module and will initiate redundant fans shutdown
All wired safeties will send an alarm to system frontend when enabled

Filter Monitor

Pressure Differential between intake and discharge side of filter will be monitored with an analog signal.
System will alarm upon detection of dirty filter (set point adjustable)

Remote Relief Damper Control

Remote damper to be open to maintain building static pressure as required during economizer operation, coordinate with balancing contractor.

III. Series Fan Powered VAV Box Sequence

Run Conditions

Zone shall have independent schedule capability. Scheduling shall be from a global schedule input, from local schedule or from a group schedule.
Outside air temperature shall be available from a global broadcast for local control options.

Zone Setpoint Control

Zone sensor in all areas except common areas and restrooms shall include set point adjustment and timed local override (optional). Setpoint adjustment shall be by means of an adjustable slide lever and setback override shall be from a button located on the sensor. Setback override can be cancelled by holding the momentary contact button down for 3 seconds. Default set point adjustment will be plus or minus 1°F and timed override will be 30 minutes per pulse with a maximum override of 180 minutes. Adjustment values and override times shall be programmable for each sensor.
Zone set point control uses a modified Zone PID algorithm to provide a smooth modulated or staged variable for cooling and heating.
Zone control shall alarm on high or low zone temperature. Zone Temperature alarms will be disabled during Optimal Start, 1st 30 minutes of scheduled occupancy or during Setback override.

Supply air temperature monitor shall be included and shall alarm on high or low supply air temperature differential from space temperature.

Cooling Control

When space temperature rises above cooling setpoint the zone setpoint control PID will modulate the variable air volume damper between the minimum ventilation air flow setpoint to maximum cooling air flow to maintain space cooling setpoint.
The fan will run during all heating and cooling operation.
If the space is requesting cooling and AHU supply air temperature exceeds zone temperature the VAV damper will close.

Fan Operation

Fan will run continuously during occupied time.
A current switch will monitor fan status. If the fan is commanded to run and does not prove status heating will be locked off and an alarm will be sent to the server.

Heating Control w/Hot Water

When space temperature falls below heating setpoint the zone setpoint control PID will drive the variable air volume damper to heating air flow setpoint.
The control will modulate the output to the HW valve between 0 and 100% as zone heating PID varies between 0 and 100%.
Heating will be locked out when outside air temperature is above 65°F.

Unoccupied Heating

When any one zone requests unoccupied heating all zones associated with that AHU will activate unoccupied heating.
Fans will operated and all zones will heat to 5°F above their unoccupied heating setpoint before the AHU is no longer requested to run for unoccupied heating.
If zone temperature falls below heating setpoint during CO_2 control operation, the zone re-heat will be enabled.

Communication between parent AHU and child Zone

The following network points will be read by parent AHU and sent by child Zone. These are the normal standard but any value can be mapped to the parent AHU from the child Zone.
Occupied Run time
Unoccupied Run time
Zone Cooling Percent
Zone Heating Percent
Zone Damper Position
The following network points will be read by child Zone and sent by parent AHU. These are the normal standard but any value can be mapped to the child Zone from the parent AHU.
AHU Supply Air Temperature
AHU Supply Static Pressure

IV. Exhaust Fan Controls

The exhaust fan shall be enabled during scheduled occupancy.
Fan motor status will be monitored. If exhaust fan has been commanded to run by the BAS system and **t**he fan status is not indicated, the BAS system will send an alarm to the operator workstation.

V. Unit Heaters Control Sequence

Run Conditions

Zone shall have independent schedule capability. Scheduling shall be from a global schedule input, from local schedule or from a group schedule.
Outside air temperature shall be available from a global broadcast for local control options.

Zone Setpoint Control (review with owner prior to ordering equipment)

Zone sensor in all areas shall include set point adjustment and timed local override (optional). Setpoint adjustment and setback override shall be by means of buttons located on the sensor. Setback override can be cancelled by holding the momentary contact button down for 3 seconds. Default set point adjustment will be plus or minus 1°F and timed override will be 30 minutes per pulse with a maximum override of 180 minutes. Adjustment values and override times shall be programmable for each sensor.

Zone set point control uses a modified Zone PID algorithm to provide a smooth modulated or staged variable for cooling and heating. The equipment will cycle on at preset PID output and off when PID output drops to a lower preset level from the PID.
Zone high or low zone temperature alarms will be available. When enabled, Zone Temperature alarms will be disabled during Optimal Start, 1st 30 minutes of scheduled occupancy or during Setback override. Supply air temperature monitor shall be included and high or low supply air temperature differential from space temperature alarms will be available.

Fan Control

The fan will be enabled to run continuously whenever zone is operating in an occupied mode and there is a need for heating. The fan will cycle on for heating to maintain unoccupied zone setpoints.
Fan motor status will be monitored. If supply fan has been commanded to run by the DDC system and the fan status is not indicated, the DDC system will generate an alarm.

SECTION 15990

TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for testing, adjusting, and balancing of revised air systems, Fan Powered VAV Box hydronic flow adjustment, and the associated equipment.
B. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data and recommending solutions to deficiencies in the installed system.

1.2 RELATED WORK

A. Contract Drawings and Supplementary Conditions, including General Conditions.

1.3 SUBMITTALS

A. Submit proof that the prepared testing, adjusting and balancing agency meet the specified requirements.
B. Submit sample forms of the test reports that will be submitted by entity performing work of this Section, indicating all data and parameters included.
C. Provide certified test reports, signed by the authorized representative of the testing and balancing firm. The reports shall be certified proof that the systems have been tested, adjusted and balanced in accordance with the selected reference standards (NEBB or AABC); are an accurate representation of how the systems are operating. Reports to include a minimum of:
    1. Design airflow compared to actual airflow.
    2. Model numbers and serial numbers.
    3. Amperage and voltage readings.
    4. Notes of any discrepancies.

1.4 QUALITY ASSURANCE

A. The systems shall be tested, adjusted and balanced by mechanics regularly employed by an independent testing, adjusting and balancing Subcontractor. The testing, adjusting and balancing Subcontractor shall have a minimum of 3 years experience.
B. The project supervisor shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB).

1.5 PERFORMANCE REQUIREMENTS

A. Procedures, measurements, instruments and test reports for testing, adjusting and balancing work shall comply with all applicable Federal, State and Local laws, ordinances, regulations and codes, and the latest industry standards including, but not limited to the entities listed below:
   1. National Environmental Balancing Bureau (NEBB)
   2. Associated Air Balance Council (AABC)
B. Balance systems to within 10% of design criteria. Coordinate with mechanical contractor to modify the systems as required to meet the 10% requirement.

1.6 JOB CONDITIONS

A. The contractor shall furnish and install balancing dampers, pressure taps, gauges, valves, and other components as required for a properly balanced system, whether or not specified herein or shown on the Contract Drawings, all at no additional cost to the owner. Adjustment or replacement parts recommended by the testing and balancing specialist shall be made in strict accordance with the respective equipment manufacturer's recommendations.

PART 2 PRODUCTS

2.1 BALANCING EQUIPMENT

A. Balance report to include equipment used by the balancing contractor, along with documentation of last calibration.

PART 3 EXECUTION

3.1 EXAMINATION

A. Balancing contractor responsible to provide all equipment required to perform balancing. Contractor is responsible for coordination of the controls system in to order perform the balancing as required.
B. Balancing contractor responsible for obtaining the Contract Documents and understanding the design concepts.
C. Balancing contractor responsible for review of installation of mechanical systems noting any instances where the installation does not meet the standards as specified.
D. Balancing contractor to verify that all proper startup procedures were followed prior to proceeding with the balancing. Balancing contractor is not to balance any equipment that has not received factory startup per specifications.
E. Refrigerant systems are fully charged.
F. Rotational equipment is operating in the correct direction.
G. No damage to new equipment.
H. Controls are completed and all safety devices are calibrated and functional.

3.2 TESTING, ADJUSTING AND BALANCING

A. Balancing contractor to record all equipment data.
B. Record voltage and amperage readings
C. Adjust airflow at each supply diffuser and return grille as shown on Contract Drawings.
D. Adjust water flow at each flow control device, verifying designed flows at each piece of mechanical equipment.
E. Review correct operation of controls as system is tested in all modes. Document discharge air temperatures in all settings. Verify all dampers and actuators are operating in the correct direction.
F. Permanently mark all settings
G. Provide operational checks on all smoke and fire damper operation.
H. Verify operation of all actuators and dampers in system.
I. Record all data required and prepare report for O&M manuals

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General wiring devices.
B. Electrical delivery systems.
C. Demolition of existing electrical.

1.2 RELATED SECTIONS

A. General Conditions

1.3 REFERENCES

A. EIA/TIA 569A, Commercial Building Wiring Standard.
B. Federal Communications Commission (FCC), Code of Federal Regulations, Part 68.
C. National Electric Code (NEC).
D. National Electrical Manufacturer's Association (NEMA).
E. National Fire Protection Association (NFPA):
    1. NFPA 70: National Electrical Code (copyrighted by NFPA, ANSI approved) - hereinafter referred to as NEC.
F. Underwriters Laboratory, Inc. (UL).

1.4 SUBMITTALS

A. Submit under provisions in General Conditions .
B. Product Data: Manufacturer's data sheets on each product to be used, including:
    1. Preparation instructions and recommendations.
    2. Storage and handling requirements and recommendations.
    3. Installation methods.
C. Shop Drawings: Provide diagrams, schematics of networked systems indicating system performance and identifying components with location.
    1. Panel Drawings: Submit dimensional drawings.
    2. One Line Diagrams: Submit one line diagrams of the system configuration proposed if it differs from that illustrated in the riser diagram included in these Construction Documents. Submit one line drawings indicating location and addresses of all hardware, including, but not limited to, panel board or load center, circuit breaker, and charging stations.

3. Wiring Diagrams: Submit wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer installed wiring and field installed wiring, and between components provided by the manufacturer and those provided by others.
   a. Submit typical connection diagrams for all components including, but not limited to, panel boards, communications devices, and personal computers.
4. Conduit, breakers and wiring as detailed on Contract Drawings.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be a licensed electrical firm that shall have minimum of 2 years documented successful installation experience with projects utilizing similar equipment that is required for this project.

B. Product Requirements:
1. Product shall be manufactured by an ISO 9001-2000 Certified facility.
2. Product shall be free from defects in material or workmanship.
3. Critical manufacturing processes of the product shall have documented in-process inspections and production testing according to ISO 9001-2000.
4. Product shall be lot-traceable by date code.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in supplier’s or manufacturer’s original wrappings and containers, labeled with supplier’s or manufacturer’s name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Ambient temperature range between -22 degrees F to 131 degrees F (-30 degrees C to 55 degrees C). Ambient humidity range 0% to 95%, non-condensing.

C. Store on a pallet or shelf elevated from the ground.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions out side manufacturer's absolute limits.

1.8 DEMOLITION

A. Contractor responsible for the removal of all equipment shown in the contract documents shown to be removed. Contractor to dispose of items off site.
B. Contractor responsible for patching all surfaces exposed after demolition of any existing equipment to match the adjacent surface.
C. Contractor responsible to remove all components associated with equipment being removed, including but not limited to controls and electrical back to nearest panel. Contractor may reuse any circuits that are sized and located for equipment being served.
D. Contractor responsible to maintain all access paths to new or existing equipment, locate electrical conduit and components out of access paths.

1.9 WARRANTY

A. Provide manufacturer's standard warranty. Product is warranted free of defects in material or workmanship. Product is warranted to perform the intended function within design limits.
B. Field-applied paint coatings on raceway, boxes, plates or fittings shall be excluded from raceway manufacturer's warranty.
C. Provide a one year warranty on parts and service.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Hubbell Wiring Devices-Kellems used for performance and standard reference.

2.2 GENERAL WIRING DEVICES

A. Receptacles: UL Listed, CSA Certified. Colors as selected from manufacturer's standard colors.
    1. Hubbell Specification Grade Commercial Series Receptacles:
        a. Rating and Type: 15 & 20A 125V, 2P 3W, side and backed wired duplex receptacles, tampered resistant, BR15TR Series.
    2. 4-Plex Receptacle Series:
        a. Rating and Type: 15 & 20A 125V, 2P 3W 4-PLEX receptacles and accessories, HBL415 Series.
B. Switches: UL Listed UL20, CSA Certified. Colors as selected from manufacturer's standard colors.
    1. Specification Grade Commercial Series:
        a. Rating and Type: 15A & 20A, 120-277V AC single pole through four-way, construction series toggle, back and side

wired, CSB115 Series.

b. Rating and Type: 15A & 20A, 120-277V AC single pole through four-way, commercial series toggle, side wired only, CS115 Series.

C. Ground Fault Products: UL Listed, CSA Certified. Colors as selected from manufacturer's standard colors.

1. Hubbell Industrial Tamper Resistant GFCI Series:

a. Rating andType: 15 & 20A, 125V, 2P 3W grounding straight blade AUTOGUARD self test, tamper resistant industrial grade GFCI receptacles, GFR5262SG Series.

b. Rating and Type: 15 & 20A, 125V, 2P 3W grounding straight blade tamper resistant industrial grade GFCI receptacles, GFR5262TR Series.

2.3 ELECTRICAL DELIVERY SYSTEMS

A. Conduits:

1. Electric Metallic Tubing (EMT)
2. Minimum ¾” conduit size, see Contract Documents for required size.

2.4 WIRE AND CABLE

A. Refer to Contract Documents.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates and supporting structures have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify engineer of unsatisfactory preparation before proceeding.

C. Review all equipment shown on mechanical plans, electrical contractor to verify correct voltage, phase and circuit size prior to equipment ordering and rough in. Notify engineer of any discrepancy prior to ordering or rough in.

3.2 INSTALLATION

A. Install in strict accordance with the NEC, manufacturer's instructions and requirements indicated on the Drawings.

B. Raceway system shall be free of open gaps and exposed uneven cuts.

C. All outlets, boxes, and enclosures shall be fastened securely to walls or permanent structures.

D. Verify power wires and data cables are separated by a physical barrier.

Power wires and data cables shall not be combined in any channel.

E. Contractor is not to cut or notch any structural member without prior approval from engineer.

F. All low voltage wiring is to be concealed in EMT within walls, in mechanical rooms, and in any location visible to the occupants during normal occupancy

G. All low voltage connections are to be performed in a junction box with cover.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION