



# **REQUEST FOR PROPOSAL**

## **Construction**

### **R23-087CA**

**Date issued: July 31, 2023**

# **DOMESTIC WATER HEATER REPLACEMENT**

## **THE CITY OF COLORADO SPRINGS**

### **Contact:**

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City of Colorado Springs  
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[crystal.abeyta@coloradosprings.gov](mailto:crystal.abeyta@coloradosprings.gov)



**The City of Colorado Springs requests Firm Fixed Price (FFP) proposals, as detailed in this Request for Proposal (RFP), for Removal and Demolition of Existing Boilers AND Installation of (2) New Water Heater Units by an experienced General Contractor at Colorado Springs Municipal Court.**

**This RFP is posted to Rocky Mountain E-Purchasing BidNet Direct and the City of Colorado Springs' Procurement Services Website. It is available for all vendors free of charge, following free registration, at the Rocky Mountain E-Purchasing BidNet Direct website.**

**SUBMITTALS FOR THIS PROJECT WILL ONLY BE ACCEPTED ON THE ROCKY MOUNTAIN E-PURCHASING BIDNET DIRECT PLATFORM.**

**Please login to the following website to register (Free Registration) to submit a bid for this project. All required documents will be uploaded to the website.**

**<https://www.bidnetdirect.com/>**

**BIDNET Support**

**800-835-4603**

**Estimated Project Magnitude: \$135,000 - \$180,000**



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## SECTION I – PROPOSAL INFORMATION

### 1.0 PROPOSAL INFORMATION

Section I provides general information to potential Offerors, such as proposal submission instructions and other similar administrative elements. This RFP is available on BidNet Direct under the Rocky Mountain E-Purchasing Group ([www.BidNetDirect.com](http://www.BidNetDirect.com)). All addenda or amendments shall be issued through BidNet Direct and may not be available through any other source.

### 1.1 RFP SCHEDULE OF EVENTS

The upcoming schedule of events is as follows:

<b><u>Event</u></b>	<b><u>Date</u></b>
<b>Issue Request for Proposal</b>	July 31, 2023
<b>Pre-Proposal Conference</b>	August 10, 2023 at 1:00PM

We will hold a Pre-Proposal Conference at the Colorado Springs Municipal Court, 224 E. Kiowa Street, Colorado Springs, CO 80903. This meeting is not mandatory. However, all Offerors are encouraged to attend.

**Cut Off Date for Questions** August 17, 2023 by 3:00PM

All questions must be submitted electronically via the BidNet Direct Procurement Platform ([www.bidnetdirect.com](http://www.bidnetdirect.com)) to the following Contract Specialist. All questions must be received no later than the cut off date listed above.

Requests for Information, support and questions shall be directed to:

Crystal Abeyta, [crystal.abeyta@coloradosprings.gov](mailto:crystal.abeyta@coloradosprings.gov)

<b>DO NOT CONTACT ANY OTHER INDIVIDUAL AT THE CITY OF COLORADO SPRINGS REGARDING THIS SOLICITATION.</b>
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**The only acceptable method of submitting questions is electronically via BidNet Direct. Faxes or physical mail delivery are not acceptable.**

<b>Proposal Due Date</b>	August 28, 2023 by 3:00PM
<b>Interviews (if applicable)</b>	Not Applicable
<b>Award of Contract</b>	September 2023
<b>Notice to Proceed</b>	September 2023



## 1.2 SUBMISSION OF PROPOSAL

Proposals are to be submitted electronically on BidNet Direct ([www.bidnetdirect.com](http://www.bidnetdirect.com)). Please review the submission requirements **well in advance** of submission date and time, and allow for ample time to upload each required document. It is recommended that Offerors begin the submission process at least one (1) day in advance of the proposal deadline.

Offerors are solely responsible to ensure all required proposal documents are uploaded and submitted correctly, and that a **confirmation number** is obtained upon successful submission. Customer support for BidNet Direct may be reached at (800) 835-4603.

\*\*\*\*\***NO LATE OFFERS WILL BE ACCEPTED**\*\*\*\*\*

**Date/Time**: Proposals shall be received on or before 3:00PM MST, Monday, August 28, 2023.

## 1.3 NUMBER OF COPIES

Offerors shall submit **one (1)** softcopy to the BidNet Direct platform. Upon submission, all proposal documents shall become and remain the property of the City of Colorado Springs.

## 1.4 SPECIAL TERMS

Please note the following definitions of terms as used herein:

The term “City” means the City of Colorado Springs.

The term “Contractor” or “Consultant” means the Offeror whose offer is accepted and is awarded the contract to provide the products or services specified in the RFP.

The term “Offer” means the proposal.

The term “Offeror” means the person, firm, or corporation that submits a formal proposal or offer and that may or may not be successful in being awarded the contract.

The term “Project” refers to Domestic Water Heater Replacement.

The term “Request for Proposal” or “RFP” means this solicitation of a formal, negotiable proposal/offer. Any offer that is accepted will be the offer that is deemed by the City of Colorado Springs to be most advantageous in terms of the criteria designated in the RFP.

## 1.5 RFP OBJECTIVE

The objective of this RFP is to provide sufficient information to enable qualified Offerors to submit written proposals to the City of Colorado Springs. The RFP is not a contractual offer or commitment to purchase products or services. The Offeror may present options and variables to the scope while still meeting the minimum requirements of this solicitation. Innovative proposals/solutions are encouraged and considered in the selection and/or award.



All information included in proposals must be legible. Any and all corrections and or erasures must be initialed by Offeror. Each proposal shall be accompanied by a cover letter signed by an authorized representative of the Offeror. The contents of the proposal submitted by the successful Offeror may become part of any contract awarded as a result of this solicitation.

## **1.6 CONFIDENTIAL OR PROPRIETARY INFORMATION**

If an Offeror believes that parts of an offer are confidential, then the Offeror must so specify. The Offeror must include in bold letters the term “CONFIDENTIAL” on that part of the offer which the Offeror believes to be confidential. The Offeror must submit in writing specific detailed reasons, including any relevant legal authority, stating why the Offeror believes the material to be confidential. Vague and general claims as to confidentiality will not be accepted. The City of Colorado Springs will be the sole judge as to whether a claim is acceptable. Decisions regarding the confidentiality of information will be made when requests are made to make the information public. All offers and parts of offers, which are not marked as confidential, will automatically be considered public information after the contract is awarded. The successful offer may be considered public information even though parts are marked confidential.

## **1.7 AMENDMENTS**

Amendments to this RFP may be issued at any time prior to the time set for receipt of proposals. Offerors are required to acknowledge receipt of any amendments issued to this RFP by returning a signed copy of each amendment issued. Signed copies of each amendment must be received on or before the time set for receipt of offers.

The City of Colorado Springs will post all amendments on BidNet Direct under the Rocky Mountain E-Purchasing Group ([www.BidNetDirect.com](http://www.BidNetDirect.com)). It is the Offeror's responsibility to check the website for posted amendments or contact the Contracts Specialist listed in RFP §1.1 to confirm the number of amendments which have been issued.

## **1.8 WITHDRAWAL OR MODIFICATION OF OFFERS**

Any Offeror may modify or withdraw an offer in writing at any time prior to the deadline for submission of an offer.

## **1.9 ACCEPTANCE**

Any offer received and not withdrawn shall be considered an offer, which may be accepted by the City of Colorado Springs based on initial submission without discussions or negotiations.

By submitting an offer in response to this solicitation, the Offeror agrees that any offer it submits may be accepted by the City of Colorado Springs at any time within 90 calendar days from the date of submission deadline.

The City of Colorado Springs reserves the right (a) to reject any or all offers,(b) to waive informalities and minor irregularities in offers received, and/or (c) to accept any portion of an offer if deemed in the best interest of the City of Colorado Springs. Failure of the Offeror to provide in its offer any information requested in the RFP may result in rejection of the offer for non-responsiveness.



### **1.10 PROPOSAL PREPARATION COST**

The cost of proposal preparation is not a reimbursable cost. Proposal preparation shall be at the Offeror's sole expense and is the Offeror's total and sole responsibility.

### **1.11 AWARD**

The City of Colorado Springs intends to make an award using the evaluation criteria listed in this RFP to determine the best value, considering all factors and criteria in the proposals submitted. Best value means the expected outcome of an acquisition that, in the City's estimation, provides the greatest overall benefit in response to the requirements detailed in the RFP. The City of Colorado Springs reserves the right to reject any or all offers and to not make an award.

### **1.12 PERFORMANCE PERIOD**

The performance period for the project detailed in this RFP will be established as from **Notice to Proceed – December 31, 2023.**

### **1.13 DEBRIEFING**

Offerors not selected may request a debriefing on the selection process as well as discussion of the strengths and weaknesses of their proposal upon receipt of notification that their offer was not selected.

A debriefing may be scheduled by contacting the Contracts Specialist listed above. The Contracts Specialist must receive a written request for debriefing no later than ten (10) calendar days after issuance of a notification that the Offeror's offer was not selected.

### **1.14 SUBSTANTIVE PROPOSALS**

By responding to this RFP, the Offeror certifies (a) that Offeror's proposal is genuine and is not made in the interest of, or on behalf of, an undisclosed person, firm, or corporation; (b) that Offeror has not directly or indirectly induced or solicited any other offerors to put in a false or sham proposal; (c) that Offeror has not solicited or induced any other person, firm, or corporation to refrain or abstain from proposing an offer or proposal; (d) that Offeror has not sought by collusion to obtain for themselves any advantage over any other offerors or over the City of Colorado Springs; and (e) that Offeror has not violated or caused any person to violate, and shall not violate or cause any person to violate, the City's Code of Ethics contained in Article 3, of Chapter 1 of the City Code and in the City's Procurement Rules and Regulations.

### **1.15 OFFEROR'S QUALIFICATIONS**

Each Offeror must complete Exhibit 6 – Qualification Statement.

No contract will be awarded to any Offeror who is in arrears to the City, upon any debt or contract, or who is in default, in any capacity, upon any obligation to the City or is deemed to be irresponsible or unreliable by the City based on past performance.



## **1.16 NON-COLORADO ENTITIES**

If Offeror is a foreign entity, Offeror shall comply with C.R.S. section 7-90-801, “Authority to transact business or conduct activities required,” and section 7-90-802, “Consequences of transacting business or conducting activities without authority.”

Before or at the time that the contract is awarded to an entity organized or operating outside the State of Colorado, such entity shall obtain authorization to do business in the State of Colorado, designate a place of business herein, and appoint an agent for service of process.

Such entity must furnish the City of Colorado Springs with a certificate from the Secretary of the State of Colorado to the effect that a certificate of authority to do business in the State of Colorado has been issued by that office and is still valid. The entity shall also provide the City with a certified copy of the designation of place of business and appointment of agent for service of process from the Colorado Secretary of State, or a letter from the Colorado Secretary of State that such designation of place of business and agent for service of process has been made.

## **1.17 PROCUREMENT RULES AND REGULATIONS**

All projects advertised by the City of Colorado Springs are solicited in accordance with the City's Procurement Rules and Regulations. The City's Procurement Rules and Regulations can be reviewed and/or downloaded from the City website [www.coloradosprings.gov](http://www.coloradosprings.gov). The Contracts Specialist may also provide a softcopy of the Rules and Regulations upon request. Any discrepancies regarding conflicting statements, decisions, irregularities, clauses, or specifications will be rectified utilizing the City's Procurement Rules and Regulations, when applicable. It is the Offeror's responsibility to advise the Contracts Specialist listed in this RFP of any perceived discrepancies prior to the date and time the offer is due.

## **1.18 FAIR TREATMENT OF OFFERORS**

The City Procurement Services Division shall be responsible for ensuring the procurement of products, commodities, and services are in a manner that affords all responsible businesses a fair and equal opportunity to compete. If an Offeror believes that a procurement is not conducted in a fair and equitable manner, the Offeror is encouraged to inform the City Procurement Services Manager as soon as possible.

## **1.19 ORDER OF PRECEDENCE**

Any inconsistency in this solicitation shall be resolved by giving precedence in the following order:

- A. Sections I-IV of this Solicitation
- B. Special Construction Terms and Conditions
- C. General Construction Terms and Conditions
- D. Exhibits
- E. Plans
- F. Detailed Plans
- G. Standard Drawings
  - a. Calculated dimensions will govern over scaled dimensions.
- H. Special Specifications





I. Standard Specifications

## 1.20 SALES TAX

The successful Offeror, if awarded a contract, shall apply to the Colorado Department of Revenue for a tax-exempt certificate for this project. The certificate does not apply to City of Colorado Springs Sales and Use Tax which shall be applicable and should be included in all proposals. The tax exempt project number and the exemption certificate only apply to County, PPRTA (Pikes Peak Rural Transportation Authority), and State taxes when purchasing construction and building materials **to be incorporated into this project**.

Furthermore, the exemption **does not** include or apply to the purchase or rental of equipment, supplies or materials that **do not become a part of the completed project or structure**. In these instances, the purchase or rental is subject to full taxation at the current taxation rate.

The Offeror and all subcontractors shall include in their Offer City of Colorado Springs Sales and Use Tax on the work covered by the offer, and all other applicable taxes.

Forms and instructions can be downloaded at <https://coloradosprings.gov/sales-tax/page/construction-contractors>. Questions can be directed to the City Sales Tax Division at (719) 385-5903 or [Construction\\_SalesTax@coloradosprings.gov](mailto:Construction_SalesTax@coloradosprings.gov).

Our Registration Numbers are as follows:

City of Colorado Springs

Federal I.D.: 84-6000573

Federal Excise: A-138557

State Sales Tax: 98-03479

## 1.21 BOND REQUIREMENTS

The Offeror is advised that the successful Offeror shall be required to furnish to the City of Colorado Springs, upon award, one copy of each: Performance Bond, Labor and Materials Payment Bond, and a Maintenance Bond in the amount of 100% of the total contract within ten (10) calendar days after notification of award of a contract. The cost of all bonds shall be included in Offeror's offer.

Bonds shall:

- A. Be for the full amount of the contract price.
- B. Guarantee the Contractor's faithful performance of the work under the contract, and the prompt and full payment for all labor and materials involved therein.
- C. Guarantee protection to the City of Colorado Springs against liens of any kind.
- D. Be, when a surety bond is furnished, from a surety company operating lawfully in the State of Colorado and be accompanied with an acceptable "Power-of-Attorney" form attached to each bond copy.
- E. Be issued from a surety company that is acceptable to the City of Colorado Springs.
- F. Be submitted using the forms in the Exhibit section of this solicitation.

## 1.22 INTERPRETATION OF QUANTITIES IN PROPOSAL FORM



Except as otherwise provided in this RFP, the quantities appearing in the proposal form are estimates prepared for the comparison of proposals.

After award, payment to the Contractor will be made in accordance with the following procedures:

- A. Measurement required. When the Contract requires measurement of work performed or material furnished, payment will be made for actual quantities measured and accepted.
- B. Measurement Not Required. When the Contract does not require quantities of work performed or materials furnished to be measured, payment will be made for the quantities appearing in the Contract.

The estimated quantities of work to be performed and materials to be furnished may be increased, decreased or omitted.

### **1.23 INTERPRETATION OF PLANS AND SPECIFICATIONS**

Any change to proposal forms, plans, or specifications prior to the opening of proposals will be issued by the City in the form of an Amendment. Certain individuals may be named in the RFP that have authority to provide information, clarification or interpretation to Offerors prior to opening of proposals. Information obtained from persons other than those named individuals is invalid and shall not be used for proposal purposes.

### **1.24 EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS, AND SITE OF WORK.**

The Offeror is expected to examine the site of the proposed work, the proposal, plans, specifications, supplemental specifications, special provisions, and Contract forms, before submitting a proposal. The submission of a proposal will be considered conclusive evidence that the Offeror has made this examination and is aware of the conditions to be encountered in performing the work according to the Contract.

Boring logs and other records of subsurface investigations, if they exist, are available for inspection by Offerors. These logs and records are made available so that all Offerors have access to identical subsurface information that is available to the City, and is not intended as a substitute for personal investigation, interpretation, and judgment of the Offerors.

The City does not warrant the adequacy of boring logs and other records of subsurface investigations, and such information is not considered to be a part of the Contract. When a log of test borings is included in the subsurface investigation record, the data shown in the individual log of each test boring apply only to that particular boring and are not intended to be conclusive as to the character of any material between or around test borings. If Offerors use this information in preparing a proposal, it is used at their own risk, and Offerors are responsible for all conclusions, deductions, and inferences drawn from such information.

Offerors may conduct subsurface investigations at the project site at Offeror's expense; the City will afford them this opportunity prior to public opening of proposals.

If an Offeror discovers an apparent error or omission in the proposal form, estimated quantities, plan, or specifications, the Offeror shall immediately notify the Contracting Specialist to enable



the City to make any necessary revisions. The City may consider it to be detrimental to the City for an Offeror to submit an obviously unbalanced unit proposal price.

#### **1.25 COMBINATION OR CONDITIONAL PROPOSALS**

If an RFP is issued for projects in combination and separately, the Offeror may submit proposals either on the combination or on separate units of the combination. The City reserves the right to make awards on combination or separate proposals to the advantage of the City. Combination proposals will be considered, only when specified.

#### **1.26 ANTI-COLLUSION AFFIDAVIT**

The Offeror by signing their proposal submitted to the City is certifying that the Offeror has not participated in any collusion or taken any action in restraint of free competitive bidding. This statement may also be in the form of an affidavit provided by the City and signed by the Offeror. The original of the signed anti-collusion affidavit, if separately required and provided with the RFP, shall be submitted with the proposal. The proposal will be rejected if it does not contain the completed anti-collusion affidavit.

#### **1.27 MATERIAL GUARANTY**

The successful Offeror may be required to furnish a complete statement of the origin, composition, and manufacture of materials used in the construction of the work together with samples, which will be tested for conformance with Contract requirements.



## SECTION II – PROPOSAL CONTENT

### 2.0 PROPOSAL CONTENT

Section II provides instructions regarding the format and content required for proposals submitted in response to this solicitation.

### 2.1 PROPOSAL FORMAT

Offeror's written proposal should include concise, but complete, information, emphasizing why the Offeror is best or best qualified to provide the required services. The Offeror's written proposal should include the information in the format outlined below and must be limited to no more than twenty-five (25) pages. **A page shall be defined as 8-1/2" x 11"; single sided, with one inch margins, and a minimum font of Times New Roman 10.** The only exception to the 8-1/2" x 11" paper size is the proposed project schedule. It may be submitted on 11" x 17" paper. Each 11" x 17" page for the schedule shall be counted in the overall page limitations above. Each section of the proposal should be labeled to clearly follow the requirements sections identified in this section of the RFP. The following listed Exhibits must be filled out and returned with the proposal and are not counted against the page limit:

Exhibit 1	Proposal Certification
Exhibit 3	Exceptions
Exhibit 6	Qualifications Statement
Schedule A	Price Proposal
Schedule D	Minimum Insurance Requirements
Acknowledged Addenda, if applicable	

### 2.2 COVER LETTER

The cover letter shall be no more than three pages. The cover letter shall contain at least the following information.

- A. RFP Number and Project Name.
- B. Statement that the Offeror is qualified to perform the work.
- C. Certification Statement that the information and data submitted are true and complete to the best knowledge of the individual signing the letter.
- D. Name, telephone number, email address, and physical address of the individual to contact regarding the proposal.
- E. The signature of an authorized principal, partner, or officer of the Offeror.

### 2.3 PROPOSAL CERTIFICATION

The Offeror must fill out and submit Exhibit 1 with its Proposal.

### 2.4 ORGANIZATIONAL BACKGROUND AND OVERVIEW

The Offeror must provide a brief history and overview of its company and its organizational structure, with special emphasis on how this project will fit within that structure. Also include principal place of business location(s), office locations, size of firm, and financial stability (annual



public reports or private financial statements shall be included in an appendix or under separate cover; private financial information will be kept confidential by the City).

## **2.5 PROPOSAL NARRATIVE/TECHNICAL AND MANAGEMENT APPROACH**

In the proposal narrative/technical and management approach section, the Offeror should explain what the Offeror will do and how it will perform if awarded a contract.

### **2.5.1 TECHNICAL AREA**

The Offeror must explain its overall solution, considering the scope of work or statement of work provided. The content must include, but not necessarily be limited to, the following information.

#### **A. Understanding of and Compliance with Technical Requirements**

In the Technical Area, the Offeror should address each work area in sufficient detail to demonstrate a clear and full understanding of the work necessary to complete the project. The proposal should not merely parrot the requirements of the RFP. Further, the Offeror should provide evidence of sufficient planning to ensure the work is completed on schedule and within budget. It is highly recommended that the Offeror provide sufficient content and detail to answer completely the following questions:

1. Does the proposal demonstrate a firm understanding of the requirements and goals of the Scope of Work, as well as industry standards and reasonable expectations for a company in the industry?
2. Does the proposal fully and completely address each requirement and goal of the Scope of Work?
3. Does the proposal provide solutions to indicate that requirements and goals will be met on schedule?
4. Does the technical solution seem realistic?
5. Does it generally appear that the Offeror knows and thoroughly understands the business and the RFP requirements?

#### **B. Project Approach**

In the Technical Area, the Offeror should clearly present proposed solutions and indicate that it has performed adequate planning to accomplish project tasks as defined in the Scope of Work. Innovations, efficiencies, and detailed specifics are all encouraged.

The Offeror must at least address the following areas:

1. Construction phasing
2. Schedule Management. Discuss Offeror's approach to schedule management including updating and reporting progress of the work.
3. Quality Control. Discuss Offeror's quality control plan, processes, and approach to ensure that the City receives a quality product.
4. Safety. Discuss Offeror's approach and commitment to safety for both construction workers and the public traveling through the construction site.



5. Potential issues that Offeror foresees with this project and how Offeror would make adjustments if encountered. Describe factors limiting construction phasing flexibility and potential remedies.

It is highly recommended that the Offeror provide sufficient content and detail to answer completely the following questions.

1. Does the proposal include a complete plan to accomplish each requirement, including subcontracting (if applicable)?
2. Does the proposal demonstrate that appropriate and qualified personnel and equipment will be provided to carry out the requirement?
3. Is the proper level of effort directed toward each requirement? Does the level of effort look unrealistically low or unreasonably high?

### **2.5.2 MANAGEMENT AREA**

The Offeror must explain its method of managing the work to be performed. The content must include, but no necessarily be limited to, the following information.

#### **A. Program Management Controls**

In the Management Area, the Offeror should provide:

1. A plan of operation, to include management of personnel, workload, schedule, and budget
2. An organization chart which demonstrates clear and effective lines of authority, responsibility, and communication for management, supervisory, and technical personnel. The plan should address which job classification or personnel will be assigned to each task and how that determination is made. Basic human resource management concepts should be addressed, including hiring, firing, discipline, incentive plans, etc.
3. If the Offeror plans to subcontract more than 10% of the work, include information on how the Offeror plans to manage its subcontractors.
4. A detailed construction schedule for the project showing the key construction activities and how they will meet or improve the City's timeframe and maximize construction efficiency to provide the best value to the City and minimize impacts to the public. The schedule shall be based on the Offeror's understanding and approach to the work as addressed above. Schedules should address controls to ensure the project will remain on schedule and on budget. Schedules submitted for this project shall assume a start date of September 2023.

It is highly recommended that the Offeror provide sufficient content and detail to answer completely the following questions.

1. Does the proposal address the issues above in sufficient detail to demonstrate a sophisticated and mature management control system?
2. Are program management controls consistent with the technical portion of the proposal, especially regarding schedule and level of effort?



3. Do the plan and controls indicate that the Offeror will obtain, keep, and efficiently utilize high-quality personnel?
4. Does the proposal explain how the Offeror will address corrective actions in case of delays (e.g. expediting materials, additional resources, etc.)?
5. Does the proposal explain how the Offeror will remain within schedule and budget?

#### B. Past Performance/Relevant Experience and Key Personnel

In the Management Area, the Offeror should provide at least three references or name contracts demonstrating that it successfully provided services/products that are the same or similar to those required in the RFP. The proposal should adequately explain how the projects were completed on schedule and within budget. It is highly recommended that the Offeror provide sufficient content and detail to answer completely the following questions.

1. Does the proposal include at least three references or past performance citations?
2. Are the references or past performance citations relevant to the requirements of the Scope of Work of the RFP?
3. Does the Offeror explain how they were successful on the projects provided as past performance?
4. Does the Offeror apply the past performance to the City requirement in such a way as to demonstrate added value due to experience?

#### C. Key Personnel

In the Management Area, resumes must be provided for all personnel considered key, as required by the RFP. Resumes do not count toward the page limit. It is highly recommended that the Offeror provide sufficient content and detail to answer completely the following questions. Explain how the key personnel were related to the projects cited as relevant past performance.

1. Does the Offeror provide complete resumes, including education, experience, background information, accomplishments, and other pertinent information?
2. Does the Offeror provide resumes for all key personnel, as required by the RFP?
3. Do the resumes demonstrate adequate professional, technical, and management levels to accomplish the work effectively and efficiently?

## 2.6 PRICE AREA

In the Price Area, the Offeror should provide a detailed breakdown of the price for each year of performance. The price must be all-inclusive and include all unit costs for material, labor, other direct costs (e.g. travel), indirect costs (i.e. overhead and general and administrative costs), and profit/fee. Offers must include sufficient detail to allow insight into the fairness and reasonableness of the price. If the contract type will be Time and Material (T&M) labor categories, labor rates, separated profit, and estimated material costs must be included in detail.

In addition, although price may not be the most important factor, it is still very important to the City of Colorado Springs. The Offeror's pricing must be competitive as compared to the budget



amount, market pricing in the industry, and the pricing of other Offerors. It is highly recommended that the Offeror provide sufficient content and detail to answer completely the following questions.

1. How does the price compare to the industry competition?
2. If low, is it unrealistically low?
3. If high, is there demonstrated added value for the additional cost?
4. Is the price itemized, so that it is clear how the cost was built? If so, do the costs look appropriate for the task?
5. Does the Offeror leave applicable costs out of the calculations? For instance, some will say travel is not included and will be an extra cost. This should be considered when comparing to other Offerors.
6. Are there additional costs not addressed that the City would incur if the Offeror were awarded the contract? If so, include those costs when comparing to the budget amount and the competition.

## **2.7 PROPOSAL PRESENTATION**

Presentation is an important factor. Offerors should provide a highly professional product, which is complete, accurate, easily understood, and effectively presented.

## **2.8 EXCEPTIONS**

All Offerors must complete Exhibit 3, Exceptions Form and return it with their proposal. Some terms and conditions are not negotiable. Exceptions may be grounds for rendering the proposal unacceptable without further discussions.

## **2.9 INSURANCE REQUIREMENTS**

All Offerors must complete Schedule D, Minimum Insurance Requirements and return with their proposal. Lack of responsiveness in this area may be grounds for rendering the proposal unacceptable without further discussions.





## **SECTION III – EVALUATION FACTORS**

### **3.0 EVALUATION AND AWARD**

Section III provides information regarding evaluation criteria and scoring. It also includes information regarding proposal selection and award of the resultant contract.

### **3.1 EVALUATION CRITERIA**

#### **3.1.1 TECHNICAL AREA – UNDERSTANDING OF AND COMPLIANCE WITH TECHNICAL REQUIREMENTS**

See Section II - Item 2.5.1A

#### **3.1.2 TECHNICAL AREA – PROJECT APPROACH**

See Section II - Item 2.5.1B

#### **3.1.3 MANAGEMENT AREA – PROGRAM MANAGEMENT CONTROLS**

See Section II - Item 2.5.2A

#### **3.1.4 MANAGEMENT AREA – PAST PERFORMANCE/RELEVANT EXPERIENCE/KEY PERSONNEL**

See Section II – Item 2.5.2B

#### **3.1.5 PRICE/COST AREA – PRICE/COST**

See Section II – Item 2.6

#### **3.1.6 PROPOSAL PRESENTATION AREA – PROPOSAL PRESENTATION**

See Section II – Item 2.7

#### **3.1.7 EXCEPTIONS AND INSURANCE**

See Section II – Items 2.8 and 2.9

### **3.2 RANKING**

A. The order of ranking or importance in the evaluation shall be as follows:

First: Price/Cost Area  
Second: Technical Area  
Third: Management Area  
Fourth: Proposal Presentation Area

B. Possible scores for each criterion shall be as follows:

5 – Exceptional  
4 – Very Good  
3 – Satisfactory  
2 – Marginal  
1 – Unacceptable



C. Definitions for scoring are as follows:

Exceptional – The proposal meets all and exceeds many of the requirements of the RFP to the benefit of the City, and the information provided is of such a nature as to answer all questions without need for further inquiry. There are no corrective actions required, and no compromise of requirements is needed.

Very Good – The proposal meets all and exceeds some of the requirements of the RFP to the benefit of the City, and the information provided is of such a nature as to answer most questions without need for further inquiry. There are no corrective actions required, and no compromise of requirements is needed.

Satisfactory – The proposal meets the requirements of the RFP, and the information provided is of such a nature as to answer many questions without need for further inquiry. There are very few corrective actions required, and no substantive compromise of requirements is needed.

Marginal – The proposal does not meet some of the requirements of the RFP, and the information provided is of such a nature as to require some clarification. There are some corrective actions required, and some non-substantive compromise of requirements is needed.

Unacceptable – The proposal does not meet many of the requirements of the RFP, and the information provided is of such a nature as to require much clarification. There are many corrective actions required, and substantive compromise of requirements is needed.

D. Area Scoring

The score for each area will be determined by adding the sum of the criteria in each area. The evaluation factors are as follows:

Price/Cost Area: 35  
Technical Area: 30  
Management Area: 25  
Proposal Presentation Area: 10

E. Final/Overall Scoring

The final proposal score will be determined by adding the area scoring. The sum of the area scores will be the final/overall score.

### **3.3 SELECTION COMMITTEE**

A selection committee will review all proposals. Through this process, the City will determine which proposals are acceptable or unacceptable. The City will notify, in writing, the Offerors whose proposals are deemed to be unacceptable. Those Offerors offering proposals deemed to be acceptable by the City will be evaluated and scored by the selection committee. This scoring will determine which Offerors are considered to be in the competitive range and may be the basis for an award decision without further steps.



If the selection committee elects not to award based upon evaluation scoring, it may engage in a forced elimination process. To inform this process, it may require oral presentations or interviews with the Offerors considered to be in the competitive range. If oral presentations or interviews are conducted, they may also be scored, or they may simply be considered as information supporting the forced elimination process. The selection committee may request revisions to the proposal from each of the Offerors at the conclusion of the interviews. The intent of the forced elimination process is to reach consensus. The decision will be based on all relevant factors, and based upon perception of best value. The final decision may or may not exactly reflect scoring ranking.

The City also reserves the right to request best and final offers from all Offerors at any point in the proposal evaluation process.

### **3.4 AWARD OF CONTRACT**

It is anticipated that there will be negotiations or discussions with Offerors. However, the City reserves the right to award without negotiations or discussions. The City also reserves the right to award a contract not necessarily or merely to the Offeror with the most advantageous price. The City intends to award to the Offeror that demonstrates the best value to the City and the most substantiated ability to fulfill the requirements contained in this Request for Proposal. A contract prepared by the City will be finalized and/or negotiated with the successful Offeror. In the event a contract cannot be negotiated with the top ranked Offeror, the City may enter into negotiations with the second highest ranked Offeror, or the City may decide to call for new proposals. Immediately after the notice of award, the successful Offeror will begin planning in conjunction with the City of Colorado Springs staff (to be designated by the City) to ensure fulfillment of all its obligations. The successful Offeror may be expected to attend regular meetings as required by the City to assist in the preparation for startup.



## SECTION IV – SPECIAL CONTRACT TERMS AND CONDITIONS

### 4.0 SPECIAL CONTRACT TERMS AND CONDITIONS/SPECIAL SOLICITATION PROVISIONS

In addition to the special contract terms and conditions listed below, the City's sample contract, see Exhibit 2, contains contract terms and conditions.

**ADA Standards:** It is a requirement of the City and required by law that any new or renovated facility meet the scoping and technical requirements of the 2010 ADA Standards for newly designed and constructed or altered local government facilities, public accommodations, and facilities. The selected Design Professional shall design the project so it both conforms to the 2010 ADA Standards, as applicable and as amended, and is readily accessible to and usable by individuals with disabilities. The selected Contractor shall build the project so it both conforms to the 2010 ADA Standards, as applicable and as amended, and is readily accessible to and usable by individuals with disabilities. Facilities that are designed, constructed, and/or altered facilities that meet or exceed the IBC 2015/ANSI A117.1 2009, used by Pikes Peak Regional Building Department, will be accepted as meeting or exceeding the 2010 ADA Standards.



## SECTION V – EXHIBITS

### 5.0 EXHIBITS

Exhibit 1	Proposal Certification
Exhibit 2	Sample Contract
Exhibit 3	Exceptions
Exhibit 4	RESERVED
Exhibit 5	Scope of Work
Exhibit 6	Qualification Statement
Exhibit 7	Evaluation Scoresheet
Exhibit 8	Project Plans
Exhibit 9	Background Request Form (For Reference Only)
Exhibit 10	Sample Bonds
Exhibit 11	Notification of Utilities



## EXHIBIT 1 PROPOSAL CERTIFICATION

Check or Mark the space after each number to indicate compliance.

1. \_\_\_\_\_ Address of Offeror's Principal Place of Business:

\_\_\_\_\_  
\_\_\_\_\_

Does Offeror have an established office or facility in Colorado Springs?

Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, indicate address below if different than Principal Place of Business.

Colorado Springs Facility - Year established \_\_\_\_\_

Address of Colorado Springs Facility:

\_\_\_\_\_  
\_\_\_\_\_

Percent of Work to be Performed from Principal Place of Business? \_\_\_\_\_

Percent of Work to be Performed from Colorado Springs Facility? \_\_\_\_\_

2. \_\_\_\_\_ Indicate your ability to provide a certificate of insurance evidencing the required coverage types and limits specified in Minimum Insurance Requirements Exhibit. (The certificate of insurance must reflect the City of Colorado Springs as an Additional Insured, as applicable.)

Indicate your ability to comply with the following requirements:

The City shall be added as an Additional Insured to all liability policies:

Yes \_\_\_\_\_ No \_\_\_\_\_

Your property and liability insurance company is licensed to do business in Colorado:

Yes \_\_\_\_\_ No \_\_\_\_\_

Provide the name of your property and liability insurance company here:

Name: \_\_\_\_\_

Your property and liability insurance company has an AM best rating of not less than B+ and/or VII:

Yes \_\_\_\_\_ No \_\_\_\_\_

Worker's Compensation Insurance is carried for all employees and covers work done in Colorado:

Yes \_\_\_\_\_ No \_\_\_\_\_



3. \_\_\_\_\_ Provide one (1) copy of current financial statements (if required). Enclose financial information in a separate envelope; do not bind with the other proposal copies. If review of the information is to be restricted to the City's financial officer, it must be marked accordingly.
4. \_\_\_\_\_ Provide the completed and signed bid. (Bids must be identified as specified in this RFP document). All required Exhibits are attached.

By signing below, the Offeror certifies that no person or firm other than the Offeror or as otherwise indicated has any interest whatsoever in this offer or any Contract that may be entered into as a result of this offer and that in all respects the offer is legal and firm, submitted in good faith without collusion or fraud. The undersigned additionally declares that it has carefully examined the Bid information and the complete Solicitation prior to submitting a Bid. The Bidder's signature will be considered the Bidder's acknowledgement of understanding and ability to comply with all items in the solicitation.

Offeror has appointed \_\_\_\_\_ as the Offeror's representative and contact for all questions or clarifications in regard to this Offeror.

Telephone: (\_\_\_\_) \_\_\_\_\_

Email: \_\_\_\_\_

The undersigned acknowledges and understands the terms, conditions, Specifications and all Requirements contained and/or referenced and are legally authorized by the Offeror to make the above statements or representations.

\_\_\_\_\_  
(Name of Company)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
Date

\_\_\_\_\_  
(City, State and Zip)

\_\_\_\_\_  
(Telephone Number)

\_\_\_\_\_  
(Name typed/Printed)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(E-Mail Address)

<b>FEDERAL TAX ID #</b> _____ <b>This Company Is:</b> Corporation ___ Individual ___ Partnership ___ LLC ___
---

**Offeror hereby acknowledges receipt of the following amendments, if applicable.** Offeror agrees that it is bound by all Amendments identified herein.

AMENDMENT #1 \_\_\_\_\_ DATED: \_\_\_\_\_

AMENDMENT #2 \_\_\_\_\_ DATED: \_\_\_\_\_

AMENDMENT #3 \_\_\_\_\_ DATED: \_\_\_\_\_



**Please Note: the following Representations and Certifications must be initialed by Offeror in the spaces provided and returned with this certification.**

### **1. INSURANCE REQUIREMENTS**

Offeror shall comply with all insurance requirements and will submit the Insurance Certificates prior to performance start date. If limits are different from the stated amounts, Offeror shall explain variance. Certain endorsements and “additionally insured” statements may require further clarification and specific statements on a project specific basis and should have been described in the Offeror’s Bid.

---

Initials for 1

### **2. ETHICS VIOLATIONS**

- A. The Offeror shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in this clause in its own operations and direct business relationships.
- B. Offeror certifies the Offeror has not violated or caused any person to violate, and shall not violate or cause any person to violate, the City’s Code of Ethics contained in Article 3, of Chapter 1 of the City Code and in the City’s Procurement Rules and Regulations
- C. When the Offeror has reasonable grounds to believe that a violation described in this clause may have occurred, the Offeror shall promptly report the possible violation to the City Contracts Specialist in writing.
- D. The Offeror must disclose with the signing of this Bid, the name of any officer, director, or agent who is also an employee of the City and any City employee who owns, directly or indirectly, an interest of ten percent (10%) or more in the Offeror’s firm or any of its branches.
- E. In addition, the Offeror must report any conflict or apparent conflict, current or discovered during the performance of the Contract, to the City Contracts Specialist.
- F. The Offeror shall not engage in providing gifts, meals or other amenities to City employees. The right of the Offeror to proceed may be terminated by written notice issued by City Contracts Specialist if Offeror offered or gave a gratuity to an officer, official, or employee of the City and intended by the gratuity to obtain a contract or favorable treatment under a contract.
- G. The Offeror shall cooperate fully with the City or any agency investigating a possible violation on behalf of the City. If any violation is determined, the Offeror will properly compensate the City.
- H. The Offeror agrees to incorporate the substance of this clause (after substituting “Contractor” for “Offeror”) in all subcontracts under this offer.

---

Initials for 2

### **3. COOPERATION WITH OTHER CONTRACTORS**

Other City activities/contracts may be in progress or start during the performance of this contract. The Offeror shall coordinate the work harmoniously with the other contractors or City personnel, if applicable.

---

Initials for 3

### **4. INTERNET USE**

Should the Offeror require access to City Internet resources in the performance of this requirement, a “Contractor’s Internet Use Agreement” form must be separately signed by each individual having access to





the City Network. The completed Contractor's Internet Use Agreement will be maintained with this agreement. Inappropriate use of the City Network will be grounds for immediate termination of any awarded contact.

\_\_\_\_\_  
Initials for 4

## 5. LITIGATION

If awarded a contract, Offeror shall notify the City within five (5) calendar days after being served with a summons, complaint, or other pleading in any matter which has been filed in any federal or state court or administrative agency. The Offeror shall deliver copies of such document(s) to the City's Procurement Services Manager. The term "litigation" includes an assignment for the benefit of creditors, and filings of bankruptcy, reorganization and/or foreclosure.

\_\_\_\_\_  
Initials for 5

## 6. CONTRACTOR'S REGISTRATION INFORMATION

Offeror's firm verifies and states that they are (check all that apply):

- \_\_\_\_\_ Large Business (i.e. do not qualify as a small business or non-profit)
- \_\_\_\_\_ Nonprofit
- \_\_\_\_\_ Small Business
- \_\_\_\_\_ Minority Owned Business/Small Disadvantaged Business
- \_\_\_\_\_ Woman Owned Business
- \_\_\_\_\_ Veteran Owned Business
- \_\_\_\_\_ Service-Disabled Veteran Owned Business
- \_\_\_\_\_ HUBZone Business

Note: The City accepts self-certification for these categories in accordance with Small Business Administration (SBA) standards. The SBA size standards are found on the SBA website <https://www.sba.gov/content/am-i-small-business-concern>.

\_\_\_\_\_  
Initials for 6

## 7. CONTRACTOR PERSONNEL

- A. The Offeror shall appoint one of its key personnel as the "Authorized Representative" who shall have the power and authority to interface with the City and represent the Offeror in all administrative matters concerning this Bid and any awarded contract, including without limitation such administrative matters as correction of problems modifications, and reduction of costs.
- B. The Authorized Representative shall be the person identified in the Offeror's Bid, unless the Offeror provides written notice to the City naming another person to serve as its Authorized Representative. Communications received by the City Contracts Specialist from the Authorized Representative shall be deemed to have been received from the Offeror.



The individual, \_\_\_\_\_ (Name)  
with position, \_\_\_\_\_ (Title)  
Can be reached at \_\_\_\_\_  
Work telephone number: \_\_\_\_\_  
Home telephone number: \_\_\_\_\_  
Cellular telephone number: \_\_\_\_\_  
E-mail address: \_\_\_\_\_

\_\_\_\_\_  
Initials for 7

### 8. OFFEROR'S CERTIFICATION

The undersigned hereby affirms that:

- A. He/She is a duly authorized agent of the Offeror;
- B. He/She has read and agrees to the City's standard terms and conditions attached.
- C. The offer is presented in full compliance with the collusive prohibitions of the City of Colorado Springs. The Offeror certifies that no employee of its firm has discussed, or compared the offer with any other offeror or City employee and has not colluded with any other offeror or City employee.
- D. The Offeror certifies that it has checked all of its figures, and understands that the City will not be responsible for any errors or omissions on the part of the Offeror in preparing its Bid.
- E. By submitting an offer the Offeror certifies that it has complied and will comply with all requirements of local, state, and federal laws, and that no legal requirements have been or will be violated in making or accepting this solicitation.
- F. If awarded the contract, the Offeror agrees to execute and enter into a contract with the City, and furnish the necessary security within ten (10) days of receipt of the "Notice of Award"; and to begin the work within ten (10) day from the date of the receipt of the "Notice to Proceed", and to complete the Work with the above specifications.
- G. I hereby certify that I am submitting the Bid based on my company's capabilities to provide quality products and/or services on time.

\_\_\_\_\_  
Initials for 8

### 9. OFFEROR CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS:

- A. The Offeror certifies to the best of its knowledge and belief, that (i) the Offeror and/or any of its Principals
  - 1. Are ( ), Are not ( ) presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;
  - 2. Have ( ), Have not ( ), within a three year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state, local) contract or subcontract; violation of Federal or state antitrust statutes relation to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statement, tax evasion, or receiving stolen property; and
  - 3. Are ( ), Are not ( ) presently indicated for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in any paragraphs above.
- B. The Offeror shall provide immediate written notice to the City Contracts Specialist if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reasons of changed circumstances.
- C. The certification in paragraph 1. above, is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the City, the City Contracts Specialist may



terminate the contract resulting from this solicitation for default. Termination for default may result in additional charges being levied for the costs incurred by the City to initiate activities to replace the awarded Contractor.

\_\_\_\_\_  
Initials for 9

**10. ACCEPTANCE OF CITY CONTRACTS SPECIALIST'S SOLE AUTHORITY FOR CHANGES**

Unless otherwise specified in the Contract, the Offeror hereby agrees that any changes to the scope of work, subsequent to the original contract signing, shall be generated in writing and an approval signature shall be obtained from the City Contracts Specialist prior to additional work performance.

\_\_\_\_\_  
Initials for 10

**11. CITY CONTRACTOR SAFETY PROGRAM**

The Offeror hereby agrees to adhere to a worker safety program for contractor employees on a City job site or location. By initialing below, the Offeror has reviewed the information and will abide by the City Policy which is available for review:

<https://coloradosprings.gov/finance/page/procurement-regulations-and-documents>

\_\_\_\_\_  
Initials for 11

**12. ACCEPTANCE OF CITY ENVIRONMENTALLY PREFERRED PURCHASING (EPP) POLICY**

The City of Colorado Springs is committed to buying more environmentally preferable goods and services, as long as they meet performance needs, are available within a reasonable time and at a reasonable cost. The Offeror hereby acknowledges review of this policy by initialing below.

<https://coloradosprings.gov/finance/page/procurement-regulations-and-documents>

\_\_\_\_\_  
Initials for 12

**13. FRAUD, WASTE, AND ABUSE**

Everyone has a duty to report any suspected unlawful act impacting the City of Colorado Springs operations and its enterprises. Anyone who becomes aware of the existence or apparent existence of fraud, waste, and abuse in City of Colorado Springs is encouraged to report such matters to the City Auditor's Office in writing or on the telephone hotline 385-2387 (ADTR). Written correspondence can be mailed to:

City Auditor  
P.O. Box 2241  
Colorado Springs CO 80901

Or via email [FraudHotline@coloradosprings.gov](mailto:FraudHotline@coloradosprings.gov). Any of these mechanisms allow for anonymous reporting. For more information, please go to the website <https://coloradosprings.gov/cityfraud>.

\_\_\_\_\_  
Initials for 14

Name of Company: \_\_\_\_\_



Federal Tax ID Number: \_\_\_\_\_

DUNS Number: \_\_\_\_\_

Principal Place of Business: \_\_\_\_\_

\_\_\_\_\_  
Signature of Authorized Representative

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_



**EXHIBIT 2 SAMPLE CONTRACT**

**CONSTRUCTION CONTRACT**

Contract Number:		Project Name/Title	
Vendor/Contractor			
Contact Name:		Telephone:	
Email Address:			
Address:			
Federal Tax ID #		Please check one:	<input type="checkbox"/> Corporation <input type="checkbox"/> Individual <input type="checkbox"/> Partnership
City Contracting Specialist		City Dept Rep	
NOT TO EXCEED Contract Amount:		City Account #	
Contract Type:	Fixed Price	Period of Performance:	

**1. INTRODUCTION**

THIS Fixed Price CONTRACT ("Contract") is made and entered into this XXX day of XXX, 2023 by and between the City of Colorado Springs, a Colorado municipal corporation and home rule city, in the County of El Paso, State of Colorado, (the "City"), and \_\_\_\_\_ (the "Contractor").

THE CITY AND THE CONTRACTOR HEREBY AGREE AS FOLLOWS:

The City has heretofore prepared the necessary Contract Documents for the following Activity: XXXX.

The Contractor did on the XXX day of XXX, 2023 submit to the City the Contractor's written offer and proposal to do the work therein described under the terms and conditions therein set forth and furnish all materials, supplies, labor, services, transportation, tools, equipment, and parts for said work in strict conformity with the accompanying Contract Documents, which are attached hereto and incorporated herein by this reference, including the following:

1. This Contract
2. Schedule A – Pricing and Contractor’s Proposal
3. Schedule B – General Construction Terms and Conditions
4. Schedule C – Special Contract Terms and Conditions
5. Schedule D – Project Specifications
6. Schedule F – Scope of Work
7. Schedule E – Minimum Insurance Requirements



## 2. COMPENSATION/CONSIDERATION

THIS FIXED UNIT PRICE CONTRACT is established at the Not to Exceed amount of \$xxxxxxx.

Subject to the terms and conditions of the Contract Documents, Contractor agrees to furnish all materials and to perform all work as set forth in its proposal and as required by the Contract Documents.

All pricing is in accordance with the fixed unit prices found in Schedule A, as proposed by the Contractor. Payment made for actual quantities as set forth in Schedule B, General Construction Terms and Conditions. At no time shall the total obligation of the City exceed the not to exceed amount of this Contract.

## 3. TERM OF CONTRACT

Contractor will start work promptly after the Notice to Proceed and continue to work diligently until completed. The Contractor shall complete all work on an as ordered basis throughout the Contract period which is **the date of Notice to Proceed through December 31, 2023** ("Period of Performance") as per the specifications and drawings. The Contractor shall provide a two-year guarantee on all work performed under this Contract after the job has been completed and accepted.

## 4. INSURANCE

The Contractor shall provide and maintain acceptable Insurance Policy(s) consistent with the Minimum Insurance Requirements attached as Schedule E, which includes Property, Liability, and as otherwise listed in Schedule E. The City of Colorado Springs shall be reflected as an additional insured on the Property and Liability policy(s).

Further, Contractor understands and agrees that Contractor shall have no right of coverage under any existing or future City comprehensive, self, or personal injury policies. Contractor shall provide insurance coverage for and on behalf of Contract that will sufficiently protect Contractor, or Contractor's agents, employees, servants or other personnel, in connection with the services which are to be provided by Contractor pursuant to this Contract, including protection from claims for bodily injury, death, property damage, and lost income. Contractor shall provide worker's compensation insurance coverage for Contractor and all Contractor personnel. Contractor shall file applicable insurance certificates with the City and shall also provide additional insurance as indicated in this Contract. ***A CURRENT CERTIFICATE OF INSURANCE IS REQUIRED PRIOR TO COMMENCEMENT OF SERVICES LISTING THE CITY AS ADDITIONALLY INSURED.***

## 5. RESPONSIBILITY OF THE CONTRACTOR

- A. The Contractor shall be responsible for the professional quality, technical accuracy, and the coordination of all Scope of Work services furnished by the Contractor under this Contract. The Contractor shall, without additional compensation, correct or revise any errors or deficiencies in services provided under this Contract to the satisfaction of the City.
- B. The City's review, approval of, acceptance of, or payment for the services required under this Contract shall not be construed to operate as a waiver of any rights under this Contract or of



any cause of action arising out of the performance of this Contract, and the Contractor shall be and remain liable to the City for any and all damages to the City caused by the Contractor's negligent performance of any of the services furnished under this Contract.

- C. The rights and remedies of the City provided for under this Contract are in addition to any other rights and remedies provided by law.
- D. If the Contractor is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder.

## **6. WORK OVERSIGHT**

- A. The extent and character of the work to be done by the Contractor shall be subject to the general approval of the City's delegated Project Manager.
- B. If any of the work or services being performed does not conform with Contract requirements, the City may require the Contractor to perform the work or services again in conformity with Contract requirements, at no increase in Contract amount. When defects in work or services cannot be corrected by re-performance, the City may (1) require the Contractor to take necessary action to ensure that future performance conforms to Contract requirements and (2) reduce the Contract price to reflect the reduced value of the work or services performed.
- C. If the Contractor fails to promptly perform the defective work or services again or to take the necessary action to ensure future performance is in conformity with Contract requirements, the City may (1) by Contract or otherwise, perform the services and charge to the Contractor any cost incurred by the City that is directly related to the performance of such work or service or (2) terminate the Contract for breach of contract.

## **7. SUBCONTRACTORS, ASSOCIATES, AND OTHER CONTRACTORS**

- A. Any subcontractor, outside associates, or other contractors used by the Contractor in connection with Contractor's work under this Contract shall be limited to individuals or firms that are specifically identified by the Contractor in the Contractor's proposal and agreed to by the City. The Contractor shall obtain the City's Project Manager's written consent before making any substitution of these subcontractors, associates, or other contractors.
- B. The Contractor shall include a flow down clause in all of its subcontracts, agreements with outside associates, and agreements with other contractors. The flow down clause shall cause all of the terms and conditions of this Contract, including all of the applicable parts of the Contract Documents, to be incorporated into all subcontracts, agreements with outside associates, and agreements with other contractors. The flow down clause shall provide clearly that there is no privity of contract between the City and the Contractor's subcontractors, outside associates, and other contractors.

## **8. KEY PERSONNEL**

The key personnel listed in the proposal and/or below will be the individuals used in the performance of the work. If any of the listed key personnel leave employment or are otherwise not utilized in the performance of the work, approval to substitute must be obtained by the



Contractor from the City's Project Manager. Any substitute shall have the same or a higher standard of qualifications that the key personnel possessed at the time of Contract award.

## **9. START AND CONTINUANCE OF WORK**

It is further agreed that the Contractor will start work promptly and continue to work diligently until this Contract is completed.

## **10. APPROPRIATION OF FUNDS**

This Contract is expressly made subject to the limitations of the Colorado Constitution and Section 7-60 of the Charter of the City of Colorado Springs. Nothing herein shall constitute, nor be deemed to constitute, the creation of a debt or multi-year fiscal obligation or an obligation of future appropriations by the City Council of Colorado Springs, contrary to Article X, § 20, Colo. Const., or any other constitutional, statutory, or charter debt limitation. Notwithstanding any other provision of this Contract, with respect to any financial obligation of the City which may arise under this Agreement in any fiscal year after the year of execution, in the event the budget or other means of appropriation for any such year fails to provide funds in sufficient amounts to discharge such obligation, such failure (i) shall act to terminate this Contract at such time as the then-existing and available appropriations are depleted, and (ii) neither such failure nor termination shall constitute a default or breach of this Contract, including any sub-agreement, attachment, schedule, or exhibit thereto, by the City. As used herein, the term "appropriation" shall mean and include the due adoption of an appropriation ordinance and budget and the approval of a Budget Detail Report (Resource Allocations) which contains an allocation of sufficient funds for the performance of fiscal obligations arising under this Contract.

## **11. CHANGES**

The Contractor and the City agree and acknowledge as a part of this Contract that no change order or other form or order or directive may be issued by the City which requires additional compensable work to be performed, which work causes the aggregate amount payable under the Contract to exceed the amount appropriated for this Contract as listed above, unless the Contractor has been given a written assurance by the City that lawful appropriations to cover the costs of the additional work have been made or unless such work is covered under a remedy-granting provision of this Contract. The Contractor and the City further agree and acknowledge as a part of this Contract that no change order or other form or order or directive which requires additional compensable work to be performed under this Contract shall be issued by the City unless funds are available to pay such additional costs, and, regardless of any remedy-granting provision included within this Contract, the Contractor shall not be entitled to any additional compensation for any change which increases or decreases the Contract completion date, or for any additional compensable work performed under this Contract, and expressly waives any rights to additional compensation, whether by law or equity, unless, prior to commencing the additional work, the Contractor is given a written change order describing the change in Contract completion date or the additional compensable work to be performed, and setting forth the amount of compensation to be paid, and such change order is signed by the authorized City representative, as defined below. The amount of compensation to be paid, if any, shall be deemed to cover any and all additional, direct, indirect or other cost or expense or profit of the Contractor whatsoever. It is the Contractor's sole responsibility to know, determine, and ascertain the authority of the City representative signing any change order under this Contract.





No change, amendment, or modification to this Contract shall be valid unless duly approved and issued in writing by the City of Colorado Springs Procurement Services Division. The City shall not be liable for any costs incurred by the Contractor resulting from work performed for changes not issued in writing by the City of Colorado Springs Procurement Services Division.

The following personnel are authorized to sign changes, amendments, or modifications to this Contract.

The Project Manager: Changes up to \$14,999.99

The City of Colorado Springs Chief of Staff: Changes up to \$499,999.99

The Mayor of the City of Colorado Springs: Unlimited

## **12. ECONOMIC PRICE ADJUSTMENT**

- A. The Contractor shall notify the City of Colorado Springs Procurement Services Division if, at any time during contract performance, the rate of pay for labor or the unit prices for material shown in Schedule A experiences a significant increase. A change in price shall be considered significant when the unit price of an item increases by 10% from the execution date of this Contract. The Contractor shall furnish notice of this increase within 60 days after the increase, or within any additional period that the City Procurement Services Division may approve in writing, but not later than the date of final payment under this Contract. The notice shall include the Contractor's proposal for an adjustment in the Contract unit prices to be negotiated under paragraph (b) of this clause, and shall include, in the form required by the City Procurement Services Division, supporting data explaining the cause, effective date, and amount of the increase and the amount of the Contractor's adjustment proposal.
- B. Promptly after the City Procurement Services Division receives the notice and data under paragraph (a) of this clause, the City Procurement Services Division and the Contractor shall negotiate a price adjustment in the contract unit prices and its effective date. However, the City Procurement Services Division may postpone the negotiations until an accumulation of increases in the labor rates (including fringe benefits) and unit prices of material shown in Schedule A results in an adjustment allowable under paragraph (c)(3) of this clause. The City Procurement Services Division shall modify this contract (1) to include the price adjustment and its effective date and (2) to revise the labor rates (including fringe benefits) or unit prices of material as shown in Schedule A to reflect the increases resulting from the adjustment. The Contractor shall continue performance at current rates pending agreement on, or determination of, any adjustment and its effective date.
- C. Any price adjustment under this clause is subject to the following limitations:
  1. Any adjustment shall be limited to the effect on unit prices of the increases in the rates of pay for labor (including fringe benefits) or unit prices for material shown in Schedule A. There shall be no adjustment for:
    - (i) Supplies or services for which the production cost is not affected by such changes;
    - (ii) Changes in rates or unit prices other than those shown in Schedule A; or
    - (iii) Changes in the quantities of labor or material used from those shown in Schedule A for each item.
  2. No upward adjustment shall apply to supplies or services that are required to be delivered or performed before the effective date of the adjustment, unless the Contractor's failure to



deliver or perform according to the delivery schedule results from causes beyond the Contractor's control and without its fault or negligence, within the meaning of the Default clause.

3. There shall be no adjustment for any change in rates of pay for labor (including fringe benefits) or unit prices for material which would not result in a net change of at least 3 percent of the then-current total contract price. This limitation shall not apply, however, if, after final delivery of all line items, either party requests an adjustment under paragraph (b) of this clause.
4. The aggregate of the increases in any contract unit price made under this clause shall not exceed 10 percent of the original unit price.

### **13. ASSIGNMENT**

No assignment or transfer by the Contractor of this Contract or any part thereof or of the funds to be received thereunder by the Contractor will be recognized unless such assignment has had the prior written approval of the City and the surety has been given due notice of such assignment. Such written approval by the City shall not relieve the Contractor of the obligations under the terms of this Contract. In addition to the usual recitals in assignment contracts, the following language must be included in the assignment:

It is agreed that the funds to be paid to the assignee under this assignment are subject to a prior lien for services rendered or materials supplied for the performance of the work called for in said contract in favor of all persons, firms, or corporations rendering such services or supplying such materials.

### **14. CHOICE OF LAW**

This Contract is subject to and shall be interpreted under the law of the State of Colorado, and the Charter, City Code, Ordinances, Rules and Regulations of the City of Colorado Springs, Colorado, a Colorado home rule city. Court venue and jurisdiction shall be exclusively in the Colorado District Court for El Paso County, Colorado. The Parties agree that the place of performance for this Contract is deemed to be in the City of Colorado Springs, El Paso County, State of Colorado. The Contractor shall ensure that the Contractor and the Contractor's employees, agents, officers and subcontractors are familiar with, and comply with, applicable Federal, State, and Local laws and regulations as now written or hereafter amended.

### **15. WORKERS' COMPENSATION INSURANCE**

Contractor shall take out and maintain during the Period of Performance, Colorado Worker's Compensation Insurance for the Contractor and all employees of the Contractor. If any service is sublet by the Contractor, the Contractor shall require the subcontractor to provide the same coverage for the subcontractor and subcontractor's employees. Workers' Compensation Insurance shall include occupational disease provisions covering any obligations of the Contractor in accord with the provisions of the Workers' Compensation Act of Colorado.

### **16. INDEMNIFICATION**

Contractor agrees that the Contractor shall indemnify, defend and hold harmless the City, its officers, employees and agents, from and against any and all loss, damage, injuries, claims,



cause or causes of action, or any liability whatsoever resulting from, or arising out of, or in connection with the Contractor's obligations or actions under this Contract caused by any willful or negligent error, omission or act or a failure to observe any applicable standard of care by the Contractor or any person employed by it or anyone for whose acts the Contractor is legally liable. In consideration of the award of this Contract, to the extent damages are covered by insurance, the Contractor agrees to waive all rights of subrogation against the City, its subsidiary, parent, associated and/or affiliated entities, successors, or assigns, its elected officials, trustees, employees, agents, and volunteers for losses arising from the work performed by the Contractor for the City. The indemnification obligation shall survive the expiration or termination of this Contract

## **17. INDEPENDENT CONTRACTOR**

In the performance of the Contractor's obligations under this Contract, it is understood, acknowledged and agreed between the parties that the Contractor is at all times acting and performing as an independent contractor, and the City shall neither have nor exercise any control or direction over the manner and means by which the Contractor performs the Contractor's obligations under this Contract, except as otherwise stated within the Contract terms. The City shall not provide any direction to the Contractor on the work necessary to complete the project. Contractor understands that it is an independent contractor responsible for knowing how to perform all work or tasks necessary to complete project. The Contractor understands and agrees that the Contractor and the Contractor's employees, agents, servants, or other personnel are not City employees. The Contractor shall be solely responsible for payment of salaries, wages, payroll taxes, unemployment benefits or any other form of compensation or benefit to the Contractor or any of the Contractor's employees, agents, servants or other personnel performing services or work under this Contract, whether it is of a direct or indirect nature. Further in that regard, it is expressly understood and agreed that for such purposes neither the Contractor nor the Contractor's employees, agents, servants or other personnel shall be entitled to any City payroll, insurance, unemployment, worker's compensation, retirement or any other benefits whatsoever.

## **18. APPLICABLE LAW AND LICENSES**

In the conduct of the services or work contemplated in this Contract, the Contractor shall ensure that the Contractor and all subcontractors comply with all applicable state, federal and City and local law, rules and regulations, technical standards or specifications. The Contractor shall qualify for and obtain any required licenses prior to commencement of work.

## **19. PRIOR AGREEMENTS**

This is a completely integrated Contract and contains the entire agreement between the parties. Any prior written or oral agreements or representations regarding this Contract shall be of no effect and shall not be binding on the City. This Contract may only be amended in writing, and executed by duly authorized representatives of the parties hereto.

## **20. INTELLECTUAL PROPERTY**

The Parties hereby agree, and acknowledge, that all products, items writings, designs, models, examples, or other work product of the Contractor produced pursuant to this Contract are works made for hire, and that the City owns, has, and possesses any and all ownership rights and



interests to any work products of the Contractor made under this Contract, including any and all copyright, trademark, or patent rights, and that compensation to the Contractor for Agreement and acknowledgment of this intellectual property right section of this Contract is included in any compensation or price whatsoever paid to the Contractor under this Contract. It is the intent of the parties that the City shall have full ownership and control of the Contractor's work products produced pursuant to this Contract, and the Contractor specifically waives and assigns to the City all rights which Contractor may have under the 1990 Visual Artists Rights Act, federal, and state law, as now written or later amended or provided. In the event any products, items writings, designs, models, examples, or other work product produced pursuant to this Contract is deemed by a court of competent jurisdiction not to be a work for hire under federal copyright laws, this intellectual property rights provision shall act as an irrevocable assignment to the City by the Contractor of any and all copyrights, trademark rights, or patent rights in the Contractor's products, items writings, designs, models, examples, or other work product produced pursuant to this Contract, including all rights in perpetuity. Under this irrevocable assignment, the Contractor hereby assigns to the City the sole and exclusive right, title, and interest in and to the Contractor's products, items writings, designs, models, examples, or other work product produced pursuant to this Contract, without further consideration, and agrees to assist the City in registering and from time to time enforcing all copyrights and other rights and protections relating to the Contractor's products, items writings, designs, models, examples, or other work product in any and all countries. It is the Contractor's specific intent to assign all right, title, and interest whatsoever in any and all copyright rights in the Contractor's products, items writings, designs, models, examples, or other work product produced pursuant to this Contract, in any media and for any purpose, including all rights of renewal and extension, to the City. To that end, the Contractor agrees to execute and deliver all necessary documents requested by the City in connection therewith and appoints the City as Contractor's agent and attorney-in-fact to act for and in Contractor's behalf and stead to execute, register, and file any such applications, and to do all other lawfully permitted acts to further the registration, prosecution, issuance, renewals, and extensions of copyrights or other protections with the same legal force and effect as if executed by the Contractor; further, the parties expressly agree that the provisions of this intellectual property rights section shall be binding upon the parties and their heirs, legal representatives, successors, and assigns.

## **21. WAIVERS**

No waiver of default by the City of any of the terms, covenants, and conditions hereof to be performed, kept, and observed by the Contractor shall be construed, or shall operate, as a waiver of any subsequent default of any of the terms, covenants, or conditions herein contained to be performed, kept, and observed by the Contractor.

## **22. THIRD PARTIES**

It is expressly understood and agreed that enforcement of the terms and conditions of this Contract, and all rights of action relating to such enforcement, shall be strictly reserved to the Parties hereto, and nothing contained in this Contract shall give or allow any such claim or right of action by any other or third person or entity on such Contract. It is the express intention of the Parties hereto that any person or entity, other than the Parties to this Contract, receiving services or benefits under this Contract shall be deemed to be incidental beneficiaries only.



## **23. TERMINATION**

### **A. Termination for Convenience.**

By signing this Contract, Contractor represents that it is a sophisticated business and enters into the Contract voluntarily, has calculated all business risks associated with this Contract, and understands and assumes all risks of being terminated for convenience, whether such risks are known or not known. Contractor agrees that the City may terminate this Contract at any time for convenience of the City, upon written notice to the Contractor. Contractor expressly agrees to and assumes the risk that the City shall not be liable for any costs or fees of whatsoever kind and nature if termination for convenience occurs before Contractor begins any work or portion of the work. Contractor further expressly agrees and assumes the risks that the City shall not be liable for any unperformed work, anticipated profits, overhead, mobilizations costs, set-up, demobilization costs, relocation costs of employees, layoffs or severance costs, administrative costs, productivity costs, losses on disposal of equipment or materials, cost associated with the termination of subcontractors, costs associated with purchase orders or purchases, or any other costs or fees of any kind and nature, if Contractor has started or performed portions of the Contract prior to receiving notice from the City. The City shall be liable only for the portions of work Contractor actually satisfactorily completed up to the point of the issuance of the Notice of Termination for convenience. Upon receipt of this notice the Contractor shall immediately: discontinue all services affected (unless the notice directs otherwise), and deliver to the City all data, drawings, specifications, reports, estimates, summaries, and other information and materials accumulated in performing this Contract, whether completed or in process.

### **B. Termination for Cause: The occurrence of any one or more of the following events ("Event of Default") will justify termination for cause:**

1. Contractor's failure to perform the work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule as adjusted from time to time.
2. Contractor's disregard of the laws or regulations of any public body having jurisdiction.
3. Contractor's disregard of the authority of Project Manager.
4. Contractor's violation in any material provision of the Contract Documents.
5. Contractor's failure to make prompt payments to its subcontractors, and suppliers of any tier, or laborers or any person working on the work by, through, or under the Contractor or any of them, any all of their employees, officers, servants, members, and agents.
6. Contractor files a petition commencing a voluntary case under the U.S. Bankruptcy Code, or for liquidation, reorganization, or an arrangement pursuant to any other U.S. or state bankruptcy Laws, or shall be adjudicated a debtor or be declared bankrupt or insolvent under the U.S. Bankruptcy Code, or any other federal or state laws relating to bankruptcy, insolvency, winding-up, or adjustment of debts, or makes a general assignment for the benefit of creditors, or admits in writing its inability to pay its debts generally as they become due, or if a petition commencing an involuntary case under the U.S. Bankruptcy Code or an answer proposing the adjudication of Contractor as a debtor or bankrupt or proposing its liquidation or reorganization pursuant to the Bankruptcy Code or any other U.S. federal or state bankruptcy laws is filed in any court and Contractor consents to or acquiesces in the filing of that pleading or the petition or answer is not discharged or denied within sixty (60) Calendar Days after it is filed.
7. A custodian, receiver, trustee or liquidator of Contractor, all or substantially all of the assets



or business of Contractor, or of Contractor's interest in the Work or the Contract, is appointed in any proceeding brought against Contractor and not discharged within sixty (60) Calendar Days after that appointment, or if Contractor shall consent to or acquiesces in that appointment.

8. Contractor fails to commence correction of defective work or fails to correct defective work within a reasonable period of time after written notice.

If one or more of the events identified in Paragraphs 1-8 above occur, City may give Contractor written notice of the event and direct the event be cured. Any such Notice to Cure will provide Contractor a minimum of ten (10) calendar days to prepare and submit to the Project Manager a plan to correct the Event of Default. If such plan to correct the Event of Default is not submitted to the Project Manager within ten (10) days after the date of the written notice or such plan is unacceptable to the City, the City may, give Contractor (and the Surety, if any) written notice that Contractor's services are being terminated for cause. Upon delivery of the termination notice, City may terminate the services of Contractor in whole or in part, exclude Contractor from the site, and take possession of the work and of all Contractor's tools, appliances, construction equipment, and machinery at the project site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion), incorporate in the work all materials and equipment stored at the site or for which City has paid Contractor but which are stored elsewhere, and finish the work as City may deem expedient. In such case, Contractor shall not be entitled to receive any further payment until Certificate of Completion of the work. In the event City terminates this Contract for Cause and the cost of completing the work exceeds the unpaid balance of the Contract price, Contractor shall pay City for any costs of completion which exceed the Contract price when combined with all amounts previously paid to Contractor. When exercising any rights or remedies under this paragraph City shall not be required to obtain the lowest price for the work performed. Should the cost of such completion, including all proper charges, be less than the original Contract price, the amount so saved shall accrue to the City. Neither the City nor any officer, agent or employee of the City shall be in any way liable or accountable to the Contractor or the Surety for the method by which the completion of the said work, or any portion thereof, may be accomplished or for the price paid.

Where Contractor's services have been so terminated by City, the termination will not affect any rights or remedies of City against Contractor or Surety then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by City will not release Contractor from liability.

- C. Termination Notice. Upon receipt of a termination notice, whether for convenience or cause, the Contractor shall immediately: discontinue all services affected (unless the notice directs otherwise), and deliver to the City all data, drawings, specifications, reports, estimates, summaries, and other information and materials accumulated in performing this Contract, whether completed or in process.
- D. Removal of Equipment. Except as provided above, in the case of termination of this Contract before completion from any cause whatever, the Contractor, if notified to do so by the City, shall promptly remove any part or all of Contractor's equipment and supplies from the property of the City, failing which the City shall have the right to remove such equipment and supplies at the expense of the Contractor.



## **24. BOOKS OF ACCOUNT AND AUDITING**

The Contractor shall make available to the City if requested, true and complete records, which support billing statements, reports, performance indices, and all other related documentation. The City's authorized representatives shall have access during reasonable hours to all records, which are deemed appropriate to auditing billing statements, reports, performance indices, and all other related documentation. The Contractor agrees that it will keep and preserve for at least seven years all documents related to the Contract which are routinely prepared, collected or compiled by the Contractor during the performance of this Contract.

The City's Auditor and the Auditor's authorized representatives shall have the right at any time to audit all of the related documentation. The Contractor shall make all documentation available for examination at the Auditor's request at either the Auditor's or Contractor's offices, and without expense to the City.

## **25. COMPLIANCE WITH IMMIGRATION REFORM AND CONTROL ACT OF 1986**

Contractor certifies that Contractor has complied with the United States Immigration Reform and Control Act of 1986. All persons employed by Contractor for performance of this Contract have completed and signed Form I-9 verifying their identities and authorization for employment.

## **26. LABOR**

The Contractor shall employ only competent and skilled workmen and foremen in the conduct of work on this Contract. The Contractor shall at all times enforce strict discipline and good order among Contractor's employees. The Project Manager shall have the authority to order the removal from the work of any person, including Contractor's or any subcontractor's employees, who refuses or neglects to observe any of the provisions of these Plans or Specifications, or who is incompetent, abusive, threatening, or disorderly in conduct and any such person shall not again be employed on the Project.

In accord with the Keep Jobs in Colorado Act, codified at sections 8-17-101, et seq., C.R.S., Colorado labor shall be employed to perform the work to the extent of not less than eighty percent (80%) of each type or class of labor in the several classifications of skilled and common labor employed on this Project et seq.; provided however, that this paragraph shall not apply if the Project receives federal funding.

In no event shall the City be responsible for overtime pay.

## **27. GRATUITIES**

- A. This Contract may be terminated if the Mayor, the Mayor's designee, and/or the Procurement Services Manager determine, in their sole discretion, that the Contractor or any officer, employee, agent, or other representative whatsoever, of the Contractor offered or gave a gift or hospitality to a City officer, employee, agent or Contractor for the purpose of influencing any decision to grant a City contract or to obtain favorable treatment under any City contract.
- B. The terms "hospitality" and "gift" include, but are not limited to, any payment, subscription, advance, forbearance, acceptance, rendering or deposit of money, services, or anything of



value given or offered, including but not limited to food, lodging, transportation, recreation or entertainment, token or award.

- C. Contract termination under this provision shall constitute a breach of contract by the Contractor, and the Contractor shall be liable to the City for all costs of reletting the contract or completion of the project. Further, if the Contractor is terminated under this provision, or violates this provision but is not terminated, the Contractor shall be subject to debarment under the City's Procurement Regulations. The rights and remedies of the City provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this Contract.

## **28. NON-DISCRIMINATION**

- A. In accord with section 24-34-402, C.R.S., Title VII of the Civil Rights Act of 1964, Americans with Disabilities Act of 1990 as amended, all applicable federal and state laws, the Contractor will not discriminate against any employee or applicant for employment because of disability, race, creed, color, sex, sexual orientation, gender identity, gender expression, religion, age, national origin, or ancestry.
- B. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- C. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to disability, race, creed, color, sex, sexual orientation, gender identity, gender expression, religion, age, national origin, or ancestry.

## **29. ORDER OF PRECEDENCE**

Any inconsistency in this Contract shall be resolved by giving precedence in the following order:

- A. This Contract document with its terms and conditions
- B. Specific Construction Terms and Conditions
- C. General Construction Terms and Conditions
- D. The Scope of Work
- E. Specific Specifications
- F. General Specifications
- G. Other Appendices, Attachments, Exhibits, or Schedules

## **30. HEADINGS**

The section headings contained in this Contract are for reference purposes only and shall not affect the meaning or interpretation of this Contract.

## **31. DISPUTES**

- A. All administrative and contractual disputes arising from or related to this Contract other than those arising under Unanticipated Circumstances provisions (in section 107.27 of Schedule B





General Construction Terms and Conditions) shall be addressed in the following manner:

1. If either Party disputes or disagrees with a Contract term or the other Party's interpretation of a Contract term or has any other administrative or contractual dispute not addressed in the Unanticipated Circumstances provisions, such Party shall promptly give the other Party written notice of said dispute.
2. The Parties shall hold a meeting as soon as reasonably possible, but in no event later than thirty (30) calendar days from the initial written notice of the dispute, attended by persons with decision-making authority regarding the dispute, to attempt in good faith to negotiate a resolution of the dispute; provided, however, that no such meeting shall be deemed to vitiate or reduce the obligations and liabilities of the Parties or be deemed a waiver by a Party of any remedies to which such Party would otherwise be entitled unless otherwise agreed to by the Parties in writing.
3. If, within thirty (30) calendar days after such meeting, the Parties have not succeeded in negotiating a resolution of the dispute, they agree to submit the dispute to non-binding mediation and to bear equally the costs of the mediation.
4. The Parties will jointly appoint a mutually acceptable mediator. If they fail to do so within twenty (20) calendar days from the conclusion of the negotiation period, they shall each select a mediator. The two mediators will then appoint a third mediator who shall conduct mediation for the Parties as the sole mediator.
5. The Parties agree to participate in good faith in the mediation and negotiations for a period of thirty (30) calendar days. The substantive and procedural law of the State of Colorado shall apply to the proceedings. If the Parties are not successful in resolving the dispute through mediation, then the Parties shall be free to pursue any other remedy afforded by the laws of the State of Colorado.
6. Until final resolution of any dispute hereunder, the Contractor shall diligently proceed with the performance of this Contract as directed by the City. For purposes of this Contract, termination for convenience shall not be deemed a dispute. The City of Colorado Springs and the Contractor agree to notify each other in a timely manner of any claim, dispute, or cause of action arising from or related to this Contract, and to negotiate in good faith to resolve any such claim, dispute, or cause of action. To the extent that such negotiations fail, the City of Colorado Springs and the Contractor agree that any lawsuit or cause of action that arises from or is related to this Contract shall be filed with and litigated only by the Colorado District Court for El Paso County, CO.

### **32. DELIVERY**

The City may cancel this Contract or any portion thereof if delivery is not made when and as specified, time being of the essence in this Contract. Contractor shall pay the City for any loss or damage sustained by the City because of failure to perform in accordance with this Contract.

### **33. PAYMENTS**

All invoices shall be sent to the Project Manager identified in this Contract.

The City will pay the Contractor, upon submission of proper invoices, the prices stipulated in the Contract for services rendered and accepted, less any deductions provided in this Contract within 30 days (Net 30). The City will not pay late fees or interest. Any discount payment terms offered on the invoice may be taken by the City.



All payments for Construction will be made in accordance with the Payment provisions found in Schedule B – General Construction Terms and Conditions.

Each invoice must contain at least the following information:

Contract number, issued purchase order number, invoice number, invoice date, timeframe covered by invoice, type and amount of labor and materials used for that time period, dollar amount in unit price, extended price, and total value of invoice.

### **34. INSPECTION OF SERVICES**

The Contractor is responsible for performing or having performed all inspections and tests necessary to substantiate that the services furnished under this Contract conform to Contract requirements, including any applicable technical requirements for specified manufacturers' parts. This clause takes precedence over any City inspection and testing required in the Contract's specifications, except for specialized inspections or tests specified to be performed solely by the City.

- A. Definition of "services", as used in this clause, includes services performed, workmanship, and material furnished or utilized in the performance of services.
- B. The Contractor shall provide and maintain an inspection system acceptable to the City covering the services under this Contract. Complete records of all inspection work performed by the Contractor shall be maintained and made available to the City during Contract performance and for as long afterwards as the Contract requires.
- C. The City has the right to inspect and test all services called for by the Contract, to the extent practicable at all times and places during the term of the Contract. The City will perform inspections and tests in a manner that will not unduly delay the work.
- D. If the City performs inspections or test on the premises of the Contractor or a subcontractor, the Contractor shall furnish, and shall require subcontractors to furnish, at no increase in Contract price, all reasonable facilities and assistance for the safe and convenient performance of these duties.

### **35. SECURITY**

The City maintains security requirements regarding access to City buildings and other City workplaces and worksites on City property. All Contractor personnel accessing City buildings, workplaces, or worksites, may be required to produce a valid, Government issued picture identification. Contractor personnel lacking such identification may not be allowed access to such sites. No costs incurred by the Contractor due to City security requirements shall be allowable or payable under this Contract.

### **36. TIME IS OF THE ESSENCE**

In as much as the Contract concerns a needed or required service, the terms, conditions, and provisions of the Contract relating to the time of performance and completion of work are of the essence of this Contract. The Contractor shall begin work on the day specified and shall prosecute



the work diligently so as to assure completion of the work within the number of calendar days or date specified, or the date to which the time for completion may have been extended.

### **37. EMPLOYMENT OF LABOR**

The Contractor shall comply with, and defend and hold the City harmless from any violation of all laws and lawful rules and regulations, both of the State of Colorado and of the United States, relating to Workmen's Compensation, unemployment compensation, Social Security, payment for overtime, and all other expenses and conditions of employment under this Contract.

### **38. SALES TAX**

The Contractor must have a tax-exemption certificate from the Colorado Department of Revenue for this project. The certificate does not apply to City of Colorado Springs Sales and Use Tax which shall be applicable. The tax exempt project number and the exemption certificate only applies to County, PPRTA (Pikes Peak Rural Transportation Authority), and State taxes when purchasing construction and building materials **to be incorporated into this project**.

Furthermore, the exemption **does not** include or apply to the purchase or rental of equipment, supplies or materials that **do not become a part of the completed project or structure**. Such purchases and rentals are subject to full applicable taxation.

All contracts with subcontractors must include the City of Colorado Springs Sales and Use Tax on the work covered by the Contract, and other taxes as applicable.

Note: For all equipment, materials and supplies incorporated into the work purchased from vendors or suppliers not licensed to collect City Sales Tax (i.e. out of state suppliers, etc.), City Use Tax is due and payable to the City. The Contractor shall execute and deliver, and shall cause the Contractor's subcontractors to execute and deliver to the City Sales Tax Office, ST 16 forms listing all said equipment, materials and supplies and the corresponding use tax due, along with payment for said taxes. Any outstanding taxes due may be withheld from the final payment due the Contractor and may result in suspension of Contractor from bidding on City projects.

Forms and instructions can be downloaded at <https://coloradosprings.gov/cat/government/tax-information/sales-tax>. Questions can be directed to the City Sales Tax Division at (719) 385-5903.

Our Registration Numbers are as follows:  
City of Colorado Springs  
Federal I.D.: 84-6000573  
Federal Excise: A-138557  
State Sales Tax: 98-03479

The Contractor's payment or exemption of State of Colorado, El Paso County and City Sales and Use Taxes shall be as specified herein.



### **39. SEVERABILITY**

If any terms, conditions, or provisions of this Contract shall be held unconstitutional, illegal, or void, such finding shall not affect any other terms, conditions, or provisions of this Contract.

### **40. LIABILITY OF CITY EMPLOYEES**

All authorized representatives of the City are acting solely as agents and representatives of the City when carrying out and exercising the power or authority granted to them under the Contract. There shall not be any liability on them either personally or as employees of the City.

### **41. USE OF CITY NAME OR LOGO**

Except as otherwise provided in this Contract, the Contractor shall not refer to this Contract or the City of Colorado Springs in any advertising or promotions in such a manner as to state or imply that the product or service provided is endorsed or preferred by the City of Colorado Springs, its employees, or its Departments, or is considered by these entities to be superior to other products or services. Any use of the name or logo of the City of Colorado Springs in advertising or promotions must be approved in writing by the City of Colorado Springs Contracts Specialist assigned to the Contract prior to such use.

### **42. TRAVEL**

If travel expenses are included as a line item in this Contract, all travel expenses incurred and billable by the Contractor are subject to City approval. Air travel shall be limited to the round trip "economy coach" fare. Travel from the Colorado Springs Airport is encouraged. Unless there are extenuating circumstances, the Contractor should take advantage of lower airfares by purchasing tickets more than 14 days in advance of travel. In-state travel by air must be more economical than travel by private vehicle. Use of a private vehicle may be reimbursed per mile at the current rate published by the IRS annually. Short-term parking, long-term parking or cab fare associated with airport departure and arrival may be allowable expenses. Valet parking will not be allowed unless it is the least expensive or only option. Car rental rates may be reimbursed for car rentals no greater than the intermediate or standard classification. The City will not reimburse any other travel methods or expenses. The City will pay for lodging, meals, and miscellaneous expenses on a per diem basis only, in accordance with the current per diem rates published by the IRS annually. The City will not pay for Contractor expenses exceeding the per diem rates. Receipts for all reimbursable expenses must be provided with the Contractor's invoice.

### **43. ELECTRONIC SIGNATURE**

This Agreement and all other documents contemplated hereunder may be executed using electronic signature with delivery via facsimile transmission, by scanning and transmission of electronic files in Portable Document Format (PDF) or other readily available file format, or by copy transmitted via email, or by other electronic means and in one or more counterparts, each of which shall be (i) an original, and all of which taken together shall constitute one and the same agreement, (ii) a valid and binding agreement and fully admissible under state and federal rules of evidence, and (iii) enforceable in accordance with its terms



#### **44. APPENDICES**

The following Appendices are made a part of this Agreement:

1. Schedule A – Pricing and Contractor's Proposal
2. Schedule B – General Construction Terms and Conditions
3. Schedule C – Special Contract Terms and Conditions
4. Schedule D – Project Specifications
5. Schedule F – Scope of Work
6. Schedule E – Minimum Insurance Requirements



**CONTRACT SIGNATURE PAGE**

**IN WITNESS WHEREOF**, the parties have caused these presents to be executed on the day and the year first above written.

This Contract is executed in one (1) original copy.

<b>THE CITY OF COLORADO SPRINGS, COLORADO:</b>

<b>SECOND PARTY:</b>
<b>SAMPLE CONTRACT</b>
Corporate Name
Signature <span style="float: right;">Date</span>
Title



### EXHIBIT 3 EXCEPTIONS

Print the words "no exceptions"(here)\_\_\_\_\_ if there are no exceptions taken to any of the terms, conditions, or specifications of these proposal documents or contract.

If there are exceptions taken to any of the terms, conditions, or specifications of the proposal document or contract, they must be clearly stated on a separate sheet of paper attached to this sheet and returned with your proposal.

**Note:** All potential Offerors are hereby advised that exceptions taken may be considered during the evaluation phase which may affect the final scoring of proposals. Offerors stipulating that the City must use their contract or agreement may be determined non-responsive and their Proposal determined unacceptable.

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_  
(City, State and Zip Code)

Authorized Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Printed Name/Title: \_\_\_\_\_

Return this form with your Proposal.



**EXHIBIT 4    RESERVED**





## **EXHIBIT 5 SCOPE OF SERVICES FOR DOMESTIC WATER HEATER REPLACEMENT**

The City of Colorado Springs ("City") Municipal Court, located at 224 East Kiowa Street, Colorado Springs needs to replace its domestic water heater located on site as it has reached its end of life.

The City is seeking a qualified and experienced general contractor to remove and demolish the existing water heater and furnish and install two (2) higher-efficiency units with redundancy to reduce single points of failure. Removal and installation of new shall be done in accordance with the attached construction documents.

Attached are the project manual/construction documents and plans from Schendt Engineering.



## EXHIBIT 6 – QUALIFICATION STATEMENT

### CITY OF COLORADO SPRINGS QUALIFICATION STATEMENT

This statement will provide information which will enable the City to evaluate the qualifications of your firm and staff with regard to the requirements of this Request for Proposal. Please complete this form in its entirety and submit it (in the number of copies requested) along with the other required proposal documents. If a request in the Qualification Statement is contained in the proposal, indicate the section in the proposal where that information can be found.

**(PRINT)**

FIRM NAME: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
CITY STATE ZIP: \_\_\_\_\_  
AUTHORIZED REPRESENTATIVE: \_\_\_\_\_  
TITLE: \_\_\_\_\_  
AUTHORIZED SIGNATURE: \_\_\_\_\_  
PHONE: \_\_\_\_\_ FAX: \_\_\_\_\_  
E-MAIL ADDRESS: \_\_\_\_\_

**1. TYPE OF BUSINESS**

CORPORATION  INDIVIDUAL   
PARTNERSHIP  JOINT VENTURE   
OTHER: \_\_\_\_\_

**2. TYPE OF LICENSE & LOCATION**

\_\_\_\_\_  
\_\_\_\_\_

**3. TYPE OF SERVICE TO BE PROVIDED FOR RFP:** \_\_\_\_\_  
\_\_\_\_\_

**4. NUMBER OF YEARS IN BUSINESS:** \_\_\_\_\_

**5. ON A SEPARATE SHEET PROVIDE A BRIEF HISTORY OF YOUR FIRM, STAFF SIZE AND EXPERIENCE. SUBMIT A RESUME FOR THE PROJECT MANAGER AND EACH KEY PERSONNEL ASSIGNED TO THIS PROJECT.**

**6. WHAT OTHER NAME(S) HAS YOUR COMPANY OPERATED UNDER:** \_\_\_\_\_  
\_\_\_\_\_

**7. HAVE YOU OR YOUR FIRM EVER FAILED TO COMPLETE ANY WORK AWARDED TO YOU?** YES  NO  IF "YES", EXPLAIN:  
\_\_\_\_\_  
\_\_\_\_\_

**8. HAS ANY OFFICER OR PARTNER OF YOUR ORGANIZATION EVER BEEN AN OFFICER OR PARTNER OF ANOTHER ORGANIZATION THAT FAILED TO COMPLETE A CONTRACT WITHIN THE LAST FIVE (5) YEARS?** YES  NO   
IF "YES", EXPLAIN:

**9. HAS YOUR FIRM OR ANY PARTNERS OR OFFICERS EVER BEEN INVOLVED IN ANY**



BANKRUPTCY ACTION? YES  NO  IF "YES", EXPLAIN:

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10. ARE YOU PRESENTLY INVOLVED IN ANY LITIGATION WITH ANY GOVERNMENT AGENCY? YES  NO  IF "YES", EXPLAIN TYPE, KIND, PLAINTIFF, DEFENDANT, ETC., AND STATE THE CURRENT STATUS:

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---

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---

11. BANK REFERENCE: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_  
CONTACT: \_\_\_\_\_ PHONE: \_\_\_\_\_

12. LIST THREE (3) SIMILAR PROJECTS (LOCAL OR STATE-WIDE) **FROM LAST FIVE (5) YEARS**-INCLUDE LOCATION OF PROJECT, SIZE OF PROJECT (CONTRACT AMOUNT), CONTACT NAME, ADDRESS, TELEPHONE NUMBERS  
NOTE: DETAILED INFORMATION ON THESE PROJECTS MAY ALSO BE REQUESTED IN THE RFP PACKAGE.

1. Location of Project: \_\_\_\_\_  
Size of Project: \_\_\_\_\_  
Contract Amount: \_\_\_\_\_  
Contact Name and Title: \_\_\_\_\_  
Contract Address: \_\_\_\_\_  
Contact telephone and FAX Numbers: \_\_\_\_\_
2. Location of Project: \_\_\_\_\_  
Size of Project: \_\_\_\_\_  
Contract Amount: \_\_\_\_\_  
Contact Name: \_\_\_\_\_  
Contract Address: \_\_\_\_\_  
Contact telephone and FAX Numbers: \_\_\_\_\_
3. Location of Project: \_\_\_\_\_  
Size of Project: \_\_\_\_\_  
Contract Amount: \_\_\_\_\_  
Contact Name: \_\_\_\_\_  
Contract Address: \_\_\_\_\_  
Contact telephone and FAX Numbers: \_\_\_\_\_

13. LIST **CURRENT** SIMILAR PROJECTS (LOCAL OR STATE-WIDE) UNDER CONTRACT- INCLUDE LOCATION OF PROJECT, SIZE OF PROJECT (CONTRACT AMOUNT) CONTACT NAME, ADDRESS, TELEPHONE NUMBERS.  
NOTE: DETAILED INFORMATION ON THESE PROJECTS MAY ALSO BE REQUESTED IN THE RFP PACKAGE.

1. Location of Project: \_\_\_\_\_  
Size of Project: \_\_\_\_\_  
Contract Amount: \_\_\_\_\_  
Contact Name and Title: \_\_\_\_\_  
Contract Address: \_\_\_\_\_



---

Contact telephone and FAX Numbers:

---

2. Location of Project:

Size of Project:

Contract Amount:

Contact Name and Title:

Contact Address:

Contact telephone and FAX Numbers:

---

3. Location of Project:

Size of Project:

Contract Amount:

Contact Name and Title:

Contact Address:

Contact telephone and FAX Numbers:

---

14. LIST OF SUB-CONTRACTORS TO BE USED FOR THIS PROJECT:  
(INCLUDE NAME, ADDRESS, TELEPHONE NUMBER, TYPE OF WORK)

1. Name:

Address:

Telephone Number:

Type of Work:

2. Name:

Address:

Telephone Number:

Type of Work:

3. Name:

Address:

Telephone Number:

Type of Work:

---

**IF ADDITIONAL INFORMATION IS PROVIDED ON A SEPARATE SHEET FOR ANY OF THE ITEMS, CLEARLY SPECIFY WHERE IT CAN BE LOCATED IN YOUR PROPOSAL PACKAGE.**



**EXHIBIT 7 – EVALUATION SCORESHEET**

**PROPOSAL EVALUATION SCORE SHEET**

**SOLICITATION NUMBER AND TITLE:  
R23-087CA DOMESTIC WATER HEATER REPLACEMENT**

RFP EVALUATION CRITERIA DESCRIPTION	SCORE
<p><b>1. TECHNICAL AREA</b></p> <p>The Offeror must explain its overall solution, considering the scope of work or statement of work provided. The content must include, but not necessarily be limited to, the following information.</p>	
<p><b>A. Understanding of and compliance with technical requirements</b></p>	
<p>In the Technical Area, the Offeror should address each work area in sufficient detail to demonstrate a clear and full understanding of the work. The proposal should not merely parrot the requirements of the RFP. Further, the Offeror should provide evidence of sufficient planning to ensure the work is completed on schedule and within budget.</p> <p>Consider the following questions.</p> <ol style="list-style-type: none"> <li>1. Does the proposal demonstrate a firm understanding of the requirements and goals of the Scope of Work, as well as industry standards and reasonable expectations for a company in the industry?</li> <li>2. Does the proposal fully and completely address each requirement and goal of the Scope of Work?</li> <li>3. Does the proposal provide solutions to indicate that requirements and goals will be met on schedule?</li> <li>4. Does the technical solution seem realistic?</li> <li>5. Does it generally appear that the Offeror knows and thoroughly understands the business and requirement?</li> </ol> <p><b>COMMENTS:</b></p>	<p><b>5 – Exceptional</b>  <b>4 – Very Good</b>  <b>3 – Satisfactory</b>  <b>2 – Marginal</b>  <b>1 – Unacceptable</b></p> <p><b>Rating: _____</b></p>
<p><b>B. Project Approach</b></p>	
<p>In the Technical Area, the Offeror should clearly present proposed solutions and indicate that it has performed adequate planning to accomplish tasks as defined in the Scope of Work. Innovations, efficiencies, and detailed specifics are all encouraged.</p> <p>The Offeror must at least address the following areas:</p> <ol style="list-style-type: none"> <li>1. Construction phasing</li> </ol>	<p><b>5 – Exceptional</b>  <b>4 – Very Good</b>  <b>3 – Satisfactory</b>  <b>2 – Marginal</b>  <b>1 – Unacceptable</b></p> <p><b>Rating: _____</b></p>



<ol style="list-style-type: none"> <li>2. Schedule Management. Discuss your approach to schedule management including updating and reporting progress of the work.</li> <li>3. Quality Control. Discuss your quality control plan, processes and approach to ensure that the City receives a quality product.</li> <li>4. Safety. Discuss the contractor's approach and commitment to safety for both construction workers and the public traveling through the construction site.</li> <li>5. Potential issues that your firm foresees with this project and how you would make adjustments if encountered. Describe factors limiting construction phasing flexibility and potential remedies.</li> </ol> <p>Consider the following questions.</p> <ol style="list-style-type: none"> <li>1. Does the proposal include a complete plan to accomplish each requirement, including subcontracting (if applicable)?</li> <li>2. Does the proposal demonstrate that appropriate and qualified personnel and equipment will be provided to carry out the requirement?</li> <li>3. Is the proper level of effort directed toward each requirement? Does the level of effort look unrealistically low or unreasonably high?</li> </ol> <p><b>COMMENTS:</b></p>	
<p>Sum of Ratings in Technical Area (Add numbers in Section 1.A. and 1.B):</p>	
<p><b>2. MANAGEMENT AREA</b></p> <p>The Offeror must explain its method of managing the work to be performed. The content must include, but not necessarily be limited to, the following information.</p>	
<p><b>A. Program Management Controls</b></p>	
<p>In the Management Area, the Offeror should provide a plan of operation, to include management of personnel, workload, schedule, and budget. It should also include an organization chart which demonstrates clear and effective lines of authority, responsibility, and communication for management, supervisory, and technical personnel. The plan should address which job classification or personnel will be assigned to each task and how that determination is made. Basic human resource management concepts should be addressed, including hiring, firing, discipline, incentive plans, etc. If the Offeror plans to subcontract more than 10% of the work, include information on how the Offeror plans to manage its subcontractors.</p> <p>The Offeror shall provide a detailed construction schedule for the project showing the key construction activities and how they will meet or better the County's timeframe and maximize construction efficiency to provide the best value to the City and minimize impacts to the public. The schedule shall be based on the Offeror's</p>	<p><b>5 – Exceptional</b>  <b>4 – Very Good</b>  <b>3 – Satisfactory</b>  <b>2 – Marginal</b>  <b>1 – Unacceptable</b></p> <p><b>Rating: _____</b></p>



<p>understanding and approach to the work as addressed above. Schedules submitted for this proposal shall assume a start date of September 2023.</p> <p>Consider the following questions.</p> <ol style="list-style-type: none"> <li>1. Does the proposal address the issues above in sufficient detail to demonstrate a sophisticated and mature management control system?</li> <li>2. Are program management controls consistent with the technical portion of the proposal, especially regarding schedule and level of effort?</li> <li>3. Does the plan and controls indicate that the Offeror will obtain, keep, and efficiently utilize high quality personnel?</li> <li>4. Does the offer address corrective actions?</li> <li>5. Does the proposal explain how the Offeror will remain within schedule and budget?</li> </ol> <p><b>COMMENTS:</b></p>	
<p><b>B. Past Performance/Relevant Experience and Key Personnel</b></p>	
<p>In the Management Area, the Offeror should provide at least three references or contracts demonstrating that it successfully provided services/products same or similar to those required in the RFP. The proposal should adequately explain how the projects were completed on schedule and within budget.</p> <p>Consider the following questions.</p> <ol style="list-style-type: none"> <li>1. Does the proposal include at least three references or past performance citations?</li> <li>2. Are the references or past performance citations relevant to the requirements of the Scope of Work of the RFP?</li> <li>3. Does the Offeror explain how they were successful on the projects provided as past performance?</li> <li>4. Does the Offeror apply the past performance to the City requirement in such a way as to demonstrate added value due to experience?</li> </ol> <p>In the Management Area, resumes must be provided for all personnel considered key, as required by the RFP. It is highly recommended that the Offeror provide sufficient content and detail to answer completely the following questions. Resumes do not count toward the page limitation. Explain how the key personnel were related to the projects cited as relevant past performance.</p> <p>Consider the following questions.</p> <ol style="list-style-type: none"> <li>1. Does the Offeror provide complete resumes, including education, experience, background information, accomplishments, and other pertinent information?</li> </ol>	<p><b>5 – Exceptional</b>  <b>4 – Very Good</b>  <b>3 – Satisfactory</b>  <b>2 – Marginal</b>  <b>1 – Unacceptable</b></p> <p><b>Rating: _____</b></p>



<p>2. Does the Offeror provide resumes for all key personnel, as required by the RFP?</p> <p>3. Do the resumes demonstrate adequate professional, technical, and management levels to accomplish the work effectively and efficiently?</p> <p><b>COMMENTS:</b></p>	
<p>Sum of Ratings in Management Area (Add numbers in Sections 2.A. and 2. B.)</p>	
<p><b>3. PRICE/COST AREA</b></p>	
<p>In the Price Area, the Offeror should provide a detailed breakdown of the price for each year of performance. The price must be fully loaded/all-inclusive and include unit cost for material, labor, other direct costs (e.g. travel), indirect costs (i.e. overhead and general and administrative costs), and profit/fee. Offers must include sufficient detail to allow insight into the fairness and reasonableness of the price. If the contract type will be T&amp;M, labor categories, labor rates, separated profit, and estimated material costs must be included in detail.</p> <p>In addition, although price may not be the most important factor, it is still very important to the City of Colorado Springs. The Offeror's pricing must be competitive as compared to the budget amount, market pricing in the industry, and the pricing of the other Offerors.</p> <p>Consider the following questions:</p> <ol style="list-style-type: none"> <li>1. How does the price compare to the industry competition?</li> <li>2. If low, is it unrealistically low?</li> <li>3. If high, is there demonstrated added value for the additional cost?</li> <li>4. Can you see how the price was built? If so, do the costs look appropriate for the task?</li> <li>5. Does the Offeror leave applicable costs out of the calculations? For instance, some will say travel is not included and will be an extra cost. This should be considered when comparing to other Offerors.</li> <li>6. Are there additional costs not addressed that the City would incur if the Offeror were awarded the contract? If so, include those costs when comparing to the budget amount and the competition.</li> </ol> <p><b>COMMENTS:</b></p>	<p>5 – Exceptional 4 – Very Good 3 – Satisfactory 2 – Marginal 1 – Unacceptable</p> <p><b>Rating: _____</b></p>
<p>Total Price/Cost Area (Insert number from Section 3 evaluation above):</p>	
<p><b>4. PROPOSAL PRESENTATION</b></p>	
<p>Presentation is an important factor. Offerors should provide a highly professional product, which is complete, accurate, easily understood, and effectively presented.</p>	<p>5 – Exceptional 4 – Very Good 3 – Satisfactory</p>





<b>COMMENTS:</b>	<b>2 – Marginal</b> <b>1 – Unacceptable</b>  <b>Rating: _____</b>
Total Proposal Presentation Area (Insert number from Section 4 evaluation above):	
<b>LOCATION BONUS (IF APPLICABLE)</b>	
Total Bonus Points for location:	<b>N/A</b>
<b>EXCEPTIONS PROPOSED</b>	
What (if any) exceptions (redlines to our terms and conditions) were proposed? Are they acceptable?  <b>COMMENTS:</b>	<b>Pass/Fail</b>
<b>TOTAL SCORE – Add Evaluation Scores from Sections 1-4 and location bonus (if applicable). The sum is the total score.</b>	Total Score:

Overall Proposal **Strengths:**

Overall Proposal **Weaknesses:**

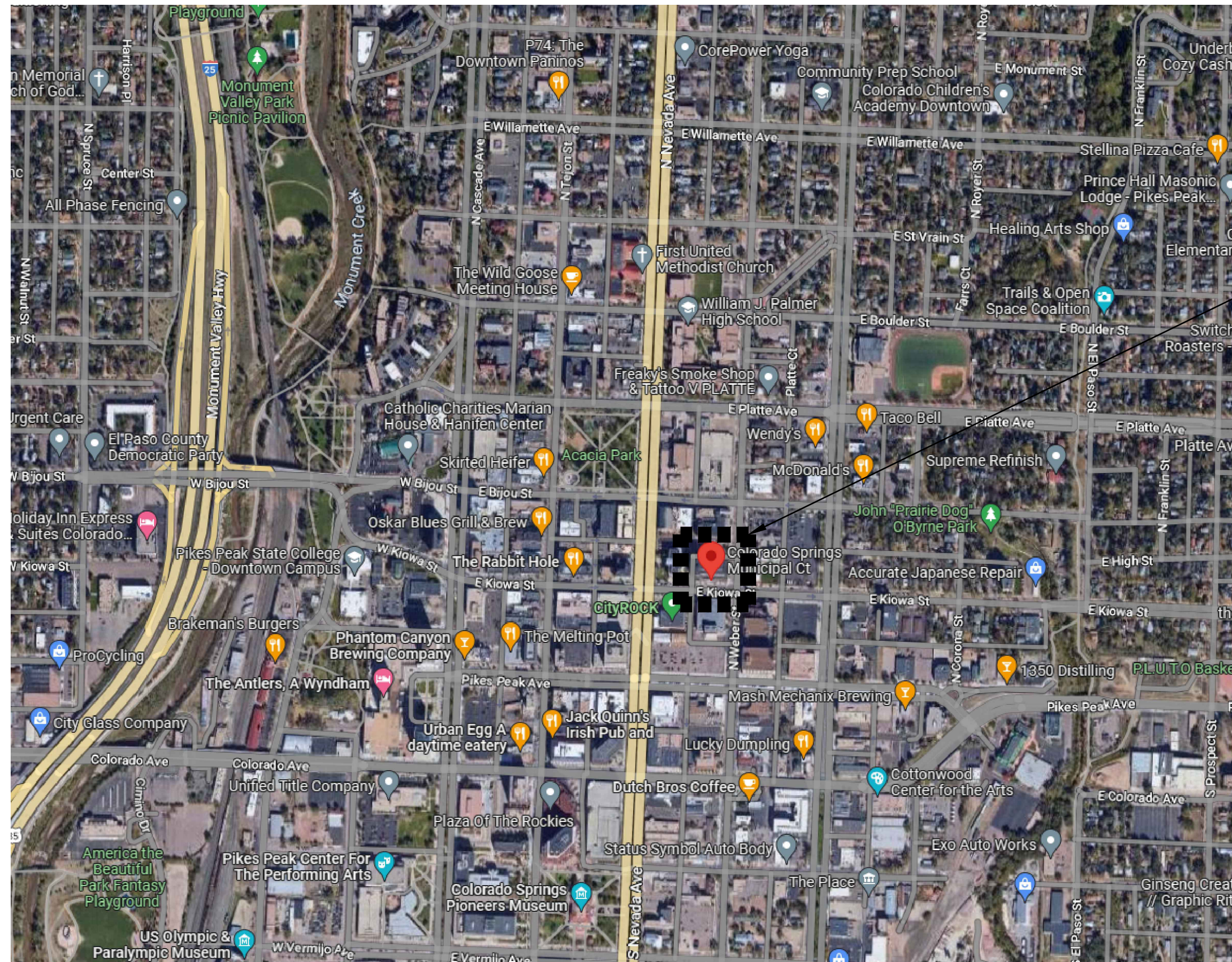


## **EXHIBIT 8 – PROJECT PLANS**

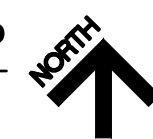
Starts on Next Page

# COLORADO SPRINGS MUNICIPAL COURT

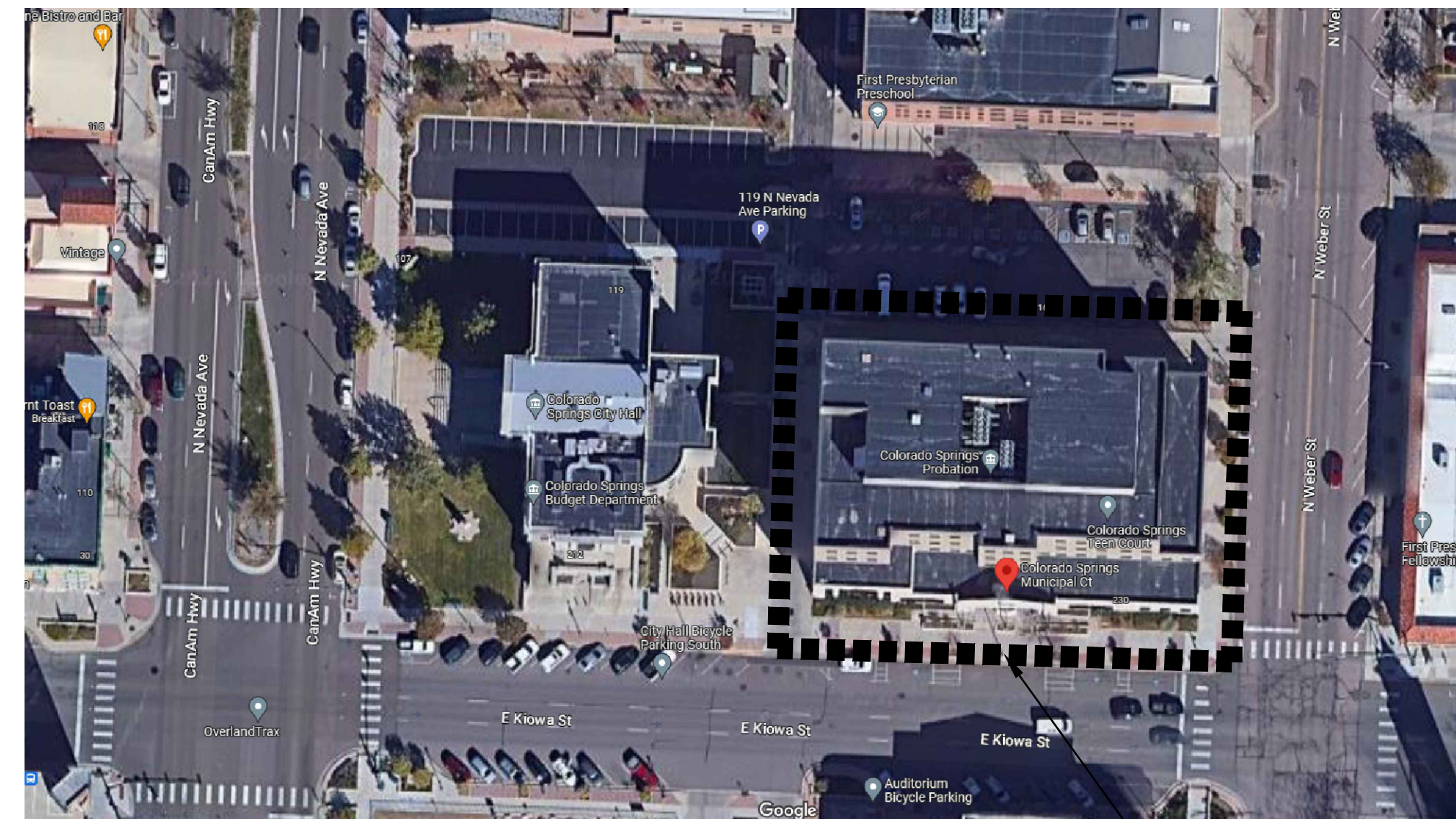
## DOMESTIC WATER HEATER REPLACEMENT 224 E. KIOWA STREET COLORADO SPRINGS, COLORADO 80903



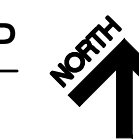
VICINITY MAP  
NO SCALE



PROJECT LOCATION



SITE MAP  
NO SCALE



PROJECT LOCATION

### SCOPE OF WORK

1. BASE BID: REPLACE DOMESTIC WATER HEATER AND APPURTENANCES. PROVIDE NEW MIXING VALVE STATION.
2. PROVIDE NEW JOHNSON CONTROLS GLOBAL CONTROL SYSTEM AND REQUIRED SOFTWARE. CONNECT AND PROVIDE CONTROLS FOR NEW DOMESTIC WATER HEATER PLANT AND CONNECT TO NEW JOHNSON CONTROLS GLOBAL CONTROL SYSTEM. CONTACT FOR JOHNSON CONTROLS IS SARA LITTLE.JOHN 615-305-9659
3. DOMESTIC HOT WATER DOWNTIME SHALL BE LIMITED TO A SINGLE 72 HOUR PERIOD ENCOMPASSING A WEEKEND FOR MINIMAL IMPACT TO BUILDING OCCUPANTS.

### PROJECT TEAM

**OWNER**  
CITY OF COLORADO SPRINGS  
MUNICIPAL COURT BUILDING  
OWNER REPRESENTATIVE  
KARL SANCHEZ  
EMAIL: Karl.Sanchez@coloradosprings.gov

**CONSULTANT**  
SCHENDT ENGINEERING CORPORATION  
5145 CENTENNIAL BLVD., SUITE 200  
COLORADO SPRINGS, CO 80919  
PHONE: (719) 637-8850

PROJECT MANAGER & MECHANICAL ENGINEER:  
LUKE BIGGS, P.E.  
EMAIL: lbiggs@secenr.com

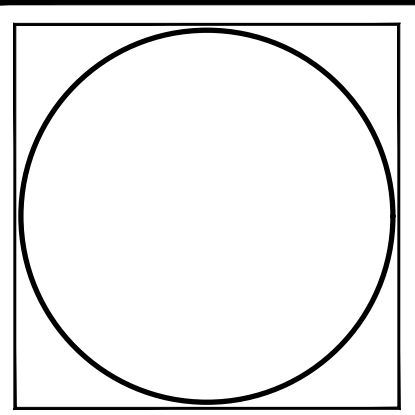
ELECTRICAL ENGINEER  
JEFF TANNER, P.E.  
EMAIL: jtanner@secenr.com

### DRAWING INDEX

DRAWING NO.	DRAWING TITLE
G0.01	COVER SHEET
M0.01	MECHANICAL LEGEND
M0.02	MECHANICAL GENERAL NOTES, SCHEDULES AND DETAILS
M4.01	BOILER ROOM MECHANICAL PLANS
P0.01	PLUMBING LEGEND
P0.02	PLUMBING GENERAL NOTES
P4.01	BOILER ROOM PLUMBING PLANS
P5.01	PLUMBING DETAILS
P6.01	PLUMBING SCHEDULES
E0.01	ELECTRICAL LEGEND AND GENERAL NOTES
E4.01	BOILER ROOM POWER PLANS
E6.01	SCHEDULES & DIAGRAMS

**SCHENDT**  
**ENGINEERING**  
**CORPORATION**  
**CONSULTING ENGINEERS**

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COLORADO SPRINGS, CO 80919  
PH: (719) 637-8850 • sec@secenr.com



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**MUNICIPAL COURT BUILDING  
DWH REPLACEMENT**


DESIGNED BY  
**LJB**

DRAWN BY  
**MES**

CHECKED BY  
**LJB**

DRAWING NO.  
**23104**

DATE  
**06/02/2023**

SHEET TITLE  
**COVER SHEET**

SHEET NO.  
**G0.01**

**VALVES & FITTINGS**

- REFRIGERANT STRAINER
- THERMOSTATIC EXPANSION VALVE
- GLOBE VALVE
- O, S, & Y GATE VALVE W/SUPERVISORY SWITCH
- GATE VALVE
- CHECK VALVE
- HOSE GATE VALVE
- PLUG VALVE OR BALANCING COCK
- NEEDLE VALVE
- STRAINER
- STRAINER W/VALVE, HOSE END & CAP
- RELIEF VALVE
- AUTOMATIC FLOW CONTROL VALVE
- MOTOR OPERATED CONTROL VALVE (2-WAY)
- MOTOR OPERATED CONTROL VALVE (3-WAY)
- TEMPERATURE REGULATING VALVE
- SOLENOID VALVE
- PRESSURE REDUCING VALVE
- FLOAT VALVE
- BUTTERFLY VALVE
- BALL VALVE
- BALANCING VALVE
- BOILER BLOW DOWN VALVE - SLOW OPENING
- BOILER BLOW DOWN VALVE - FAST OPENING
- CALIBRATED BRONZE BALANCING VALVE
- ANCHOR
- EXPANSION JOINT, SLIDING, WITH ANCHOR
- EXPANSION JOINT, BELLOWES
- PIPE GUIDE
- ELBOW
- TEE
- ELBOW DOWN
- ELBOW UP
- TEE DOWN
- TEE UP
- CAP
- UNION
- PIPE INCREASER OR DECREASER
- FLANGE
- BLIND FLANGE
- AIR VENT
- FLOW SWITCH
- VENTURI FLOW METER
- PRESSURE/TEMPERATURE TAP
- PRESSURE GAUGE
- WATER HAMMER ARRESTER
- HOSE CONNECTION W/CAP

**ABBREVIATIONS**

- ADA AMERICANS WITH DISABILITIES ACT
- AFF ABOVE FINISHED FLOOR
- BAS BUILDING AUTOMATION SYSTEM
- BOP BOTTOM OF PIPE
- DCW DOMESTIC COLD WATER
- DHW DOMESTIC HOT WATER
- DN DOWN
- (E) EXISTING
- E.A. EXHAUST AIR
- FFE FINISHED FLOOR ELEVATION
- I.E. INVERT ELEVATION
- N.I.C. NOT IN CONTRACT
- O.A. OUTSIDE AIR
- R.A. RETURN AIR
- SAN SANITARY
- S.A. SUPPLY AIR
- T.A. TRANSFER AIR
- T&P TEMPERATURE & PRESSURE
- TYP. TYPICAL
- UNO UNLESS NOTED OTHERWISE
- V VENT
- VTR VENT THROUGH ROOF
- W WASTE

**DUCTWORK**

- SUPPLY DIFFUSER:  
NECK SIZE  
DIFFUSER SYMBOL - SEE SCHEDULE
- DESIGN AIRFLOW (CFM)  
QUANTITY FOR ROOM OR SPACE  
ARROWS INDICATE DIRECTION OF THROW
- SUPPLY DIFFUSER  
SLOT TYPE
- RETURN/EXHAUST GRILLE:  
GRILLE SYMBOL - SEE SCHEDULE
- FLARED SPIN-IN FITTING  
W/ MANUAL VOLUME DAMPER
- TRANSFER AIR OPENING
- OPPOSED BLADE DAMPERS
- PARALLEL BLADE DAMPERS
- UNIT HEATER (HORIZONTAL)
- POWER OR GRAVITY ROOF  
VENTILATOR - EXHAUST (ERV)
- RECTANGULAR DUCT (1ST FIGURE, SIDE SHOWN 2ND FIGURE, SIDE NOT SHOWN)
- ACOUSTICAL LINING (DUCT DIMENSIONS FOR NET FREE AREA)
- DIRECTION OF FLOW
- DUCT SECTION (SUPPLY)
- DUCT SECTION (EXHAUST/RETURN)
- INCLINED RISE (R) OR DROP (D)  
(ARROW IN DIRECTION OF FLOW)
- TRANSITIONS
- TRANSITION: ROUND TO RECTANGULAR
- STANDARD BRANCH FOR RECTANGULAR  
SUPPLY OR RETURN DUCT
- SPLITTER DAMPER
- MANUAL VOLUME DAMPER
- MOTOR OPERATED DAMPERS
- ACCESS DOOR (AD)
- DYNAMIC FIRE DAMPER:
- CLASS I SMOKE DAMPER
- CLASS I COMBINATION  
FIRE/SMOKE DAMPER
- RADIANT DAMPER
- HEAT STOP, FLOOR/CEILING OR  
ROOF/CEILING ASSEMBLY
- TURNING VANES
- FLEXIBLE DUCT
- FLEXIBLE CONNECTION
- ROUND DUCT SYMBOL
- FLAT OVAL DUCT SYMBOL
- UNDERCUT DOOR

**REFRIGERATION**

- AD — AMMONIA DISCHARGE
- AL — AMMONIA LIQUID
- AR — AMMONIA RELIEF
- AS — AMMONIA SUCTION
- HGB — HOT GAS BYPASS
- C — CONDENSER WATER SUPPLY
- CR — CONDENSER WATER RETURN
- CHWS — CHILLED-HOT WATER SUPPLY
- CHWR — CHILLED-HOT WATER RETURN
- GCWS — GLYCOL CHILLED WATER SUPPLY
- GCWR — GLYCOL CHILLED WATER RETURN
- CWS — CHILLED WATER SUPPLY
- CWR — CHILLED WATER RETURN
- RL — REFRIGERANT LIQUID
- RS — REFRIGERANT SUCTION
- RD — REFRIGERANT DISCHARGE

**MISCELLANEOUS SYMBOLS**

- HEAVY LINE INDICATES NEW
- LIGHT LINE INDICATES EXISTING
- DIRECTION OF FLOW ARROW
- POINT OF CONNECTION OF NEW TO EXISTING

**HEATING**

- LPS — LOW PRESSURE STEAM (0-15 PSI)
- MPS — MEDIUM PRESSURE STEAM (15-50 PSI)
- HPS — HIGH PRESSURE STEAM (ABOVE 50 PSI)
- LPC — LOW PRESSURE CONDENSATE
- MPC — MEDIUM PRESSURE CONDENSATE
- HPC — HIGH PRESSURE CONDENSATE
- PC — PUMPED CONDENSATE
- BFW — FEED WATER
- HTWS — HIGH TEMPERATURE HOT WATER SUPPLY
- HTWR — HIGH TEMPERATURE HOT WATER RETURN
- MTWS — MEDIUM TEMPERATURE HOT WATER SUPPLY
- MTWR — MEDIUM TEMPERATURE HOT WATER RETURN
- HWS — LOW TEMPERATURE HOT WATER SUPPLY
- HWR — LOW TEMPERATURE HOT WATER RETURN
- GHS — GLYCOL HEATING WATER SUPPLY
- GHR — GLYCOL HEATING WATER RETURN
- HCS — DUAL TEMPERATURE WATER SUPPLY
- HCR — DUAL TEMPERATURE WATER RETURN
- BBD — BOILER BLOW-DOWN
- G — GAS
- F & T TRAP
- THERMODYNAMIC TRAP
- BUCKET TRAP
- THERMOSTATIC TRAP
- FLOAT TRAP

**MISCELLANEOUS PIPING**

- A — COMPRESSED AIR
- F — FIRE LINE
- F — UNDERSLAB FIRE LINE
- DE — DISTILLED WATER
- FOS — FUEL OIL SUPPLY
- FOR — FUEL OIL RETURN
- FOV — FUEL OIL VENT
- HE — HELIUM
- H — HYDROGEN
- ICW — INDUSTRIAL COLD WATER
- IHR — INDUSTRIAL HOT WATER RETURN
- IHW — INDUSTRIAL HOT WATER SUPPLY
- LN — LIQUID NITROGEN
- LOX — LIQUID OXYGEN
- LPG — LIQUID PETROLEUM GAS
- NO — NITROUS OXIDE
- N — NITROGEN
- OX — OXYGEN
- PN — PNEUMATIC TUBE RUN
- VAC — VACUUM
- VPD — VACUUM PUMP DISCHARGE
- BR — BRINE RETURN
- B — BRINE SUPPLY

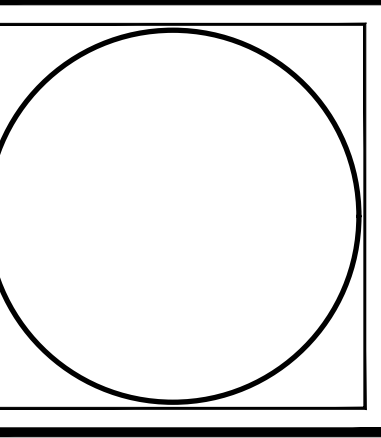
**TEMPERATURE CONTROLS**

- SEE TEMPERATURE CONTROL DRAWINGS FOR ADDITIONAL LEGEND
- TEMPERATURE SENSOR
  - NIGHT SETBACK THERMOSTAT
  - PUSH BUTTON
  - HUMIDITY SENSOR
  - OCCUPANCY SENSOR
  - VARIABLE FREQUENCY DRIVE (VFD)
  - MOTOR STARTER

**LEGEND NOTES:**

1. THESE LEGENDS ARE COMPOSED OF STANDARD SYMBOLS AND ARE PERTINENT TO THE CONDITIONS ON THIS SET OF DRAWINGS TO THE EXTENT APPLICABLE.
2. ADDITIONAL LEGENDS AND/OR ANOTHER LEGEND SHEET MAY APPEAR IN THIS SET OF DRAWINGS TO INDICATE SPECIFIC CONDITIONS IN LIEU OF SYMBOLS SHOWN ON THIS SHEET.
3. EXISTING FACILITIES TO BE REMOVED ARE INDICATED BY USE OF THE FOLLOWING SYMBOL
4. NOT ALL SYMBOLS SHOWN ON THIS LEGEND ARE NECESSARILY USED ON THE FOLLOWING SHEETS.
5. DRAWINGS ARE DIAGRAMMATIC, DO NOT SCALE FOR INSTALLATION. FIELD VERIFY ALL DIMENSIONS PRIOR TO INSTALLATION.

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**MUNICIPAL COURT BUILDING  
DWH REPLACEMENT**


DESIGNED BY  
**LJB**

DRAWN BY  
**MES**

CHECKED BY  
**LJB**

PROJECT NO.  
**23104**

DATE  
**06/02/2023**

SHEET TITLE  
**MECHANICAL  
LEGEND**

SHEET

**M0.01**

**MECHANICAL GENERAL NOTES:**

GENERAL MECHANICAL REQUIREMENTS

1. PROVIDE ALL REQUIRED PERMITS, INSPECTIONS, AND COORDINATION WITH GOVERNING AUTHORITIES. THIS SHALL INCLUDE WALKING PROJECT THROUGH THE BUILDING DEPARTMENT. INSTALLATION SHALL COMPLY WITH ALL APPLICABLE CODES, TO INCLUDE:
  - a. 2015 INTERNATIONAL BUILDING CODE (IBC)
  - b. 2015 INTERNATIONAL MECHANICAL CODE (IMC)
  - c. 2015 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
  - d. 2015 INTERNATIONAL FUEL GAS CODE (IFGC)
  - e. 2018 INTERNATIONAL PLUMBING CODE (IPC)
  - f. 2015 INTERNATIONAL FIRE CODE (IFC)
  - g. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
  - h. NFPA 13 - STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS
  - i. NFPA 70 - NATIONAL ELECTRICAL CODE (NEC) 2020
  - j. NFPA 72 - NATIONAL FIRE ALARM AND SIGNALING CODE
  - k. ASHRAE 90.1 LATEST VERSION
2. PROVIDE WEEKLY CONSTRUCTION MEETINGS.
3. WHERE CONFLICTS ARISE BETWEEN THE DRAWINGS, SPECIFICATIONS, SCHEDULES, NOTES OR OTHER ITEMS IN THE CONTRACT DOCUMENTS, THE MOST STRINGENT OF THE CONDITIONS SHALL APPLY.
4. UNLESS OTHERWISE NOTED, THE WORK DESCRIBED ON THE PLANS AND SPECIFICATIONS SHALL INCLUDE THE FURNISHING AND INSTALLATION OF ALL LABOR AND MATERIALS NECESSARY FOR COMPLETE AND OPERATIONAL SYSTEMS. CONTRACTOR SHALL FURNISH THESE EVEN IF ALL ITEMS REQUIRED (I.E. OFFSETS, ISOLATION AND BALANCING DEVICES, MAINTENANCE CLEARANCES, ETC.) ARE NOT SPECIFICALLY SHOWN.
5. DATA GIVEN ON THE DRAWINGS IS AS ACCURATE AS COULD BE SECURED. ABSOLUTE ACCURACY IS NOT GUARANTEED; THE CONTRACTOR SHALL OBTAIN AND VERIFY EXACT LOCATIONS, MEASUREMENTS, SPACE REQUIREMENTS, POTENTIAL CONFLICTS WITH OTHER TRADES, ETC. AT THE SITE AND SHALL SATISFACTORILY ADAPT HIS WORK TO ACTUAL CONDITIONS AT THE PROJECT SITE. THE DRAWINGS ARE DIAGRAMMATIC IN NATURE AND SHALL NOT BE SCALED. THIS DOES NOT RELIEVE ANY SUB-CONTRACTOR FROM COORDINATING WORK WITH ALL OTHER TRADES AND FROM ADJUSTING HIS WORK AS REQUIRED BY THE ACTUAL CONDITIONS OF THE PROJECT. THE CONTRACTOR SHALL VISIT THE SITE BEFORE SUBMITTING A BID TO BECOME THOROUGHLY FAMILIAR WITH THE ACTUAL CONDITIONS OF THE PROJECT. NO EXTRAS WILL BE ALLOWED DUE TO LACK OF KNOWLEDGE OF EXISTING CONDITIONS.
6. THE CONTRACTOR SHALL TAKE FIELD MEASUREMENTS AND VERIFY FIELD CONDITIONS AND SHALL CAREFULLY COMPARE SUCH FIELD MEASUREMENTS AND CONDITIONS AND OTHER INFORMATION KNOWN TO THE CONTRACTOR WITH THE CONTRACT DOCUMENTS BEFORE COMMENCING ANY ACTIVITIES AFFECTED THEREBY.
7. SUBMIT RFI (REQUEST FOR INFORMATION) IF QUESTIONS OR CONCERNS ARISE. ALL RFIS SHALL HAVE A PROPOSED SOLUTION.
8. VERIFY THE ELECTRICAL SERVICE PROVIDED BY THE ELECTRICAL CONTRACTOR BEFORE ORDERING ANY EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS.
9. INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. PROVIDE MANUFACTURER'S RECOMMENDED SERVICE CLEARANCE AROUND ALL EQUIPMENT. COMPLETE MANUFACTURER'S START-UP REPORTS AND SUBMIT TO ENGINEER WITH O&M MANUALS UPON COMPLETION.
10. ALL ROOF CURBS, ROOF EQUIPMENT SUPPORTS, ROOF JACKS, ROOF THIMBLES, SANITARY VENTS, ROOF DRAINS, ETC. SHALL BE COMPATIBLE WITH ROOFING SYSTEM TO BE PROVIDED. ALL ROOFING WORK SHALL BE PROVIDED BY ORIGINAL ROOFING CONTRACTOR TO MAINTAIN ROOF WARRANTY.
11. GUARANTEE ALL MATERIALS, LABOR, WORKMANSHIP AND THE PROPER OPERATION OF ALL EQUIPMENT INSTALLED FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE. REPAIR OR REPLACE, AT NO EXPENSE TO THE OWNER, ALL DEFECTS WHICH MAY ARISE DURING THIS TIME DUE TO INFERIOR OR DEFECTIVE MATERIALS, EQUIPMENT OR WORKMANSHIP.
12. DEFINITIONS:
  - a. (N) INDICATES "NEW" EQUIPMENT TO BE PROVIDED UNDER THIS CONTRACT.
  - b. (E) INDICATES "EXISTING" EQUIPMENT ON SITE WHICH MAY OR MAY NOT NEED TO BE RELOCATED AS A PART OF THIS WORK.
  - c. (D) INDICATES EXISTING EQUIPMENT SCHEDULED FOR "DEMOLITION".
  - d. "FURNISH" MEANS TO "SUPPLY" AND USUALLY REFERS TO AN ITEM OF EQUIPMENT.
  - e. "INSTALL" MEANS TO "SET IN PLACE, CONNECT AND PLACE INTO FULL OPERATIONAL ORDER".
  - f. "PROVIDE" MEANS TO "FURNISH AND INSTALL".
13. KEEP DEMOLITION & CUTTING TO MINIMUM REQUIRED FOR PROPER EXECUTION OF WORK. NO CUTTING (NOT SHOWN ON THE CONTRACT DOCUMENTS) SHALL BE DONE WITHOUT THE APPROVAL OF THE ARCHITECT, ENGINEER, OR OWNER AS TO LOCATIONS, METHOD AND EXTENT OF THE CUTTING.
14. WHERE DEMOLITION WORK IS NOTED, REMOVE ALL ASSOCIATED APPURTENANCES, HANGERS, FASTENERS, DUCT, PIPING, CONTROLS, ETC. THIS SHALL ALSO INCLUDE ANY ABANDONED EQUIPMENT, APPURTENANCES, HANGERS, FASTENERS, DUCT, PIPING, CONTROLS, ETC. NOT REQUIRED FOR NEW WORK.
15. REPAIR ALL ACCIDENTAL OR INTENTIONAL DAMAGE, PLACES WHERE DEMOLITION HAS OCCURRED, AND WHERE NEW EQUIPMENT HAS BEEN INSTALLED TO MATCH EXISTING CONSTRUCTION WITH NO NOTICEABLE DIFFERENCE IN CONTINUITY, APPEARANCE, OR FUNCTION.
16. ALL PRODUCTS SHALL BE NEW AND UNDAMAGED, UNLESS NOTED OTHERWISE. CONTRACTOR SHALL REPLACE OR REPAIR ALL PRODUCTS TO NEW CONDITION, FOR EXAMPLE, DENTED CASINGS AND EQUIPMENT DOORS, DENTED AND BENT GRILLES, REGISTERS, AND DIFFUSERS, DENTED DUCTWORK, SCRATCHED PAINT, ETC.
17. WHEN PRODUCTS ARE SPECIFIED BY MANUFACTURER AND MODEL NUMBER, EQUIVALENT PRODUCTS BY OTHER MANUFACTURERS LISTED MAY BE PROVIDED. PRODUCT EQUIVALENCY SHALL BE DETERMINED BY ENGINEER. CONTRACTOR IS RESPONSIBLE FOR COORDINATION AND DESIGN OF SUBSTITUTED EQUIPMENT; THIS SHALL INCLUDE ADDITIONAL WEIGHT, PROPER FIT, AND ALL OTHER ASPECTS.
18. FIRE STOPPING REQUIREMENT. PENETRATIONS THRU RATED WALLS AND FLOORS SHALL BE SEALED WITH A MATERIAL CAPABLE OF PREVENTING THE PASSAGE OF FLAMES AND HOT GASSES WHEN SUBJECTED TO THE REQUIREMENTS OF THE TEST STANDARD SPECIFIC FOR FIRE STOPS ASTM-E-814. ACCEPTANCE MATERIALS INCLUDE: DOW CORNING RTV FIRE STOP FOAM FOR BARE PIPE, METAL CONDUIT, AND ELECTRICAL CABLE; 3M FIRE DAM 150 CAULK FOR BARE PIPE, METAL CONDUIT, AND BUILDING CONSTRUCTION GAPS; 3M FS-195 INTUMESCENT STRIPS FOR INSULATED PIPES, PLASTIC PIPE OR CONDUIT, AND ELECTRICAL CABLE.
19. NOTIFY ENGINEER ONE WEEK IN ADVANCE WHEN WORK ABOVE CEILING IS COMPLETE AND READY FOR ABOVE CEILING OBSERVATION. CONTRACTOR SHALL REMOVE CEILING AS REQUIRED FOR ENGINEER'S OBSERVATION.
20. SUBMIT MECHANICAL AND PLUMBING EQUIPMENT, MATERIALS, AND CONTROLS SUBMITTALS TO ARCHITECT/ENGINEER FOR REVIEW PRIOR TO ORDERING EQUIPMENT.
21. MAINTAIN A MARK-UP SET OF DRAWINGS WHICH INDICATE VARIATIONS IN THE ACTUAL INSTALLATION FROM THE ORIGINAL DESIGN. SUBMIT "AS-BUILT" DRAWINGS TO THE ARCHITECT/ENGINEER FOR REVIEW PRIOR TO FINAL PAY APPLICATION. DEVIATIONS SHALL BE APPROVED PRIOR TO SUBMITTING AS-BUILTS.

22. SUBMIT ELECTRONIC PDF OF OPERATION AND MAINTENANCE MANUALS AND WARRANTIES. SUBMIT TWO (2) HARD COPIES OF ALL OPERATION AND MAINTENANCE MANUALS AND WARRANTIES IN TABBED 3-RING BINDERS TO OWNER. O&M MANUALS SHALL BE PREPARED IN FULL COMPLIANCE WITH THE 2015 IECC 408.2.5.2 "MANUALS". O&M MANUALS SHALL CONTAIN ALL TEAM CONTACTS, EMERGENCY CONTACTS, WARRANTY PROCEDURES, COMPREHENSIVE LIST OF EXTENDED WARRANTIES, COMPREHENSIVE FILTER SCHEDULE INDICATING SIZE AND TYPE OF FILTER FOR EACH PIECE OF EQUIPMENT, COMPREHENSIVE BELT SCHEDULE INDICATING SIZE AND TYPE OF BELTS FOR EACH PIECE OF EQUIPMENT, APPROVED SUBMITTALS, MANUFACTURERS' STARTUP REPORTS, TAB REPORT, CONTROLS, AND MANUFACTURERS' OPERATING MANUALS.
23. PROVIDE TRAINING FOR ALL SYSTEMS. APPROVED O&M'S SHALL BE USED FOR TRAINING. PROVIDE TRAINING AGENDA'S WITH NAME OF QUALIFIED TRAINER FOR ALL SYSTEMS. SUBMIT TRAINING ATTENDANCE SHEET FOR ALL TRAINING SESSIONS.
24. PROVIDE EMT CONDUIT FOR ALL EXPOSED LOW VOLTAGE AND CONTROL CABLING.
25. PAINT ALL EXPOSED CONDUIT, PIPING, AND DUCTWORK.
26. ISOLATE ALL PRESSURIZED PIPE (WATER, ETC.) AT EACH RISER, BRANCH, PIECE OF EQUIPMENT, AND AREA SERVED.

TESTING, ADJUSTING AND BALANCING (TAB)

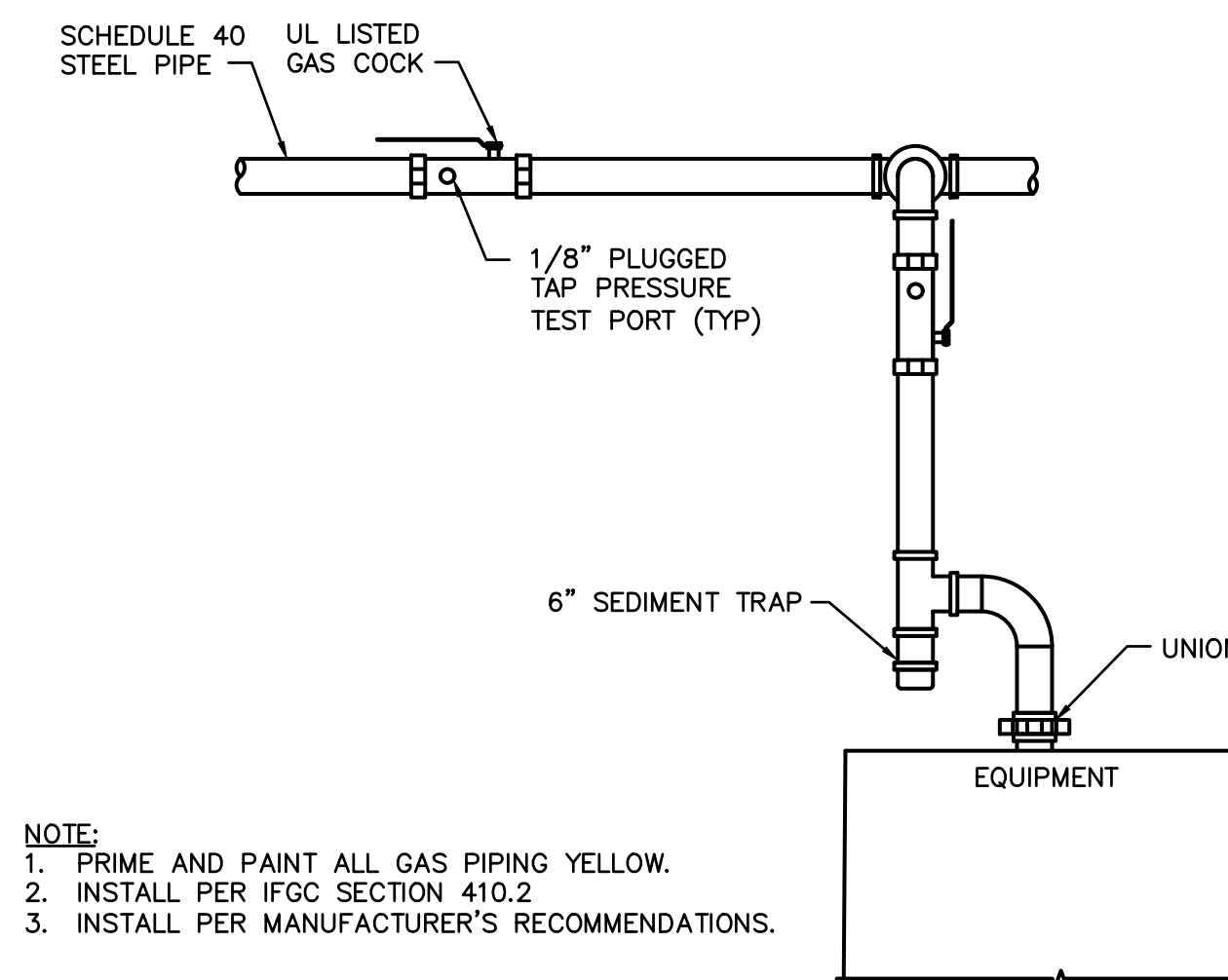
1. TAB CONTRACTOR SHALL BE NEBB, AABC, OR TABB CERTIFIED.
2. SETPOINTS REQUIRED TO BE DETERMINED BY TAB CONTRACTOR SHALL BE INDICATED ON THE REPORT. I.E., PUMP STATIC PRESSURE SETPOINT
3. ALL DEVICES SHALL BE BALANCED WITHIN 0.0 TO + 10%. HOWEVER, PRESSURE RELATIONSHIPS MUST BE MAINTAINED.

NATURAL-GAS PIPING

1. GAS PIPING SIZE 2" AND SMALLER IN UNCONCEALED SPACES SHALL BE ASTM A53, SCHEDULE 40, ERW BLACK STEEL WITH 150 PSI CAST-IRON THREADED FITTINGS. GAS PIPING SIZE 2" AND SMALLER IN CONCEALED SPACES SHALL BE ASTM A53, SCHEDULE 40, ERW BLACK STEEL WITH BUTT WELDED FITTINGS.
2. GAS PIPING SIZE 2-1/2" AND LARGER SHALL BE ASTM A53, SCHEDULE 40, ERW BLACK STEEL WITH BUTT WELDED FITTINGS.
3. EXPOSED GAS PIPING, INDOORS AND OUTDOORS SHALL BE PAINTED.
4. PROVIDE GAS COCK AND 6" DIRT LEG AT ALL GAS APPLIANCES.
5. PROVIDE GAS COCK UPSTREAM OF ALL PRESSURE REDUCING VALVES AND 6" DIRT LEGS WITH TEES TO MEASURE PRESSURE BEFORE AND AFTER PER 2015 IFGC 410.
6. LABEL GAS PIPING AND PRESSURE EVERY 10 FEET.

INSTRUMENTATION AND CONTROL FOR HVAC

1. NEW CONTROLS TO BE PROVIDED BY JOHNSON CONTROLS.
2. PROVIDE BLUE EMT CONDUIT FOR ALL LOW VOLTAGE AND CONTROL CABLING.
3. ALL THERMOSTATS AND TEMPERATURE SENSORS SHALL BE LOW VOLTAGE (24V) AND 7-DAY PROGRAMMABLE AND COMPLY WITH REQUIREMENTS OF CURRENT IECC AND ASHRAE 90.1.
4. PROVIDE COMPLETE GRAPHICS FOR ALL CONTROLLED SYSTEMS. PROVIDE UNITS FOR ALL DATE, SUCH AS CFM, PSI, DEG F, % SPEED, HZ, % OPEN, % CLOSED, NORMAL/ALARM, ON/OFF, START/STOP.
5. PROVIDE SCHEDULES FOR ALL CONTROLLED EQUIPMENT. VERIFY EXACT SCHEDULE WITH USER OR CONTACT ENGINEER.
6. SETUP TRENDS FOR ALL MOTOR STATUSES AND CONTROL VALVES.
7. PROVIDE OPERATIONAL NOTES ON GRAPHICS SO USER CAN EASILY UNDERSTAND SEQUENCE.
8. PROVIDE RELAYS AS REQUIRED TO PROVIDE GRAPHICS FOR ALL SAFETIES, SUCH AS PRESSURE HIGH LIMITS, ETC. PROVIDE ADDITIONAL TEXT ON GRAPHIC INDICATING FIELD SETPOINT.
9. SETUP ALL ALARMS AND ALARM PRIORITIES. PROVIDE MATRIX AND DEMONSTRATE DURING TRAINING.
10. ANY SETPOINT LISTED AS ADJUSTABLE (ADJ) IN SEQUENCE OF OPERATIONS SHALL BE ABLE TO BE OVERRIDDEN BY USER ON GRAPHICS.
11. PROVIDE COPY OF CONTROL AS-BUILTS AND DEVICES ON BAS.
12. PROVIDE STATUS VIA ANIMATION AND WITH TEXT, I.E. STATUS "ON".
13. PROVIDE ALGORITHM TO ELIMINATE SENSORS THAT GO OUT OF RANGE AND SEND ALARM.
14. MECHANICAL CONTRACTOR TO PROVIDE PIT PORT AND THERMOMETER OR PRESSURE GAUGE ADJACENT TO ALL TEMPERATURE AND PRESSURE SENSORS IN FIELD INSTALLED PIPING.
15. LABEL LOCATION OF ALL CONTROL DEVICE ON AS-BUILTS.



- NOTE:
1. PRIME AND PAINT ALL GAS PIPING YELLOW.
  2. INSTALL PER IFGC SECTION 410.2
  3. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

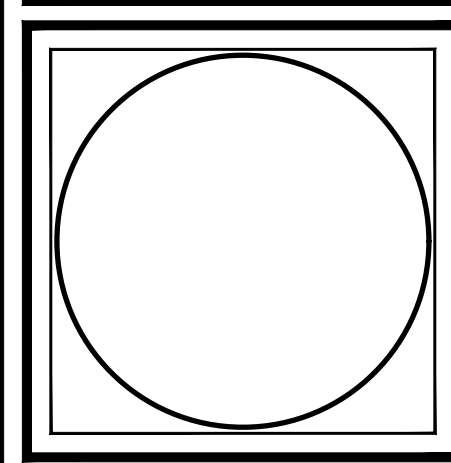
CONNECTED GAS LOAD SCHEDULE								REMARKS	
PRV STATION	MARK	DESCRIPTION	EXISTING LOAD			NEW/REMAINING LOAD			
			INPUT @SL (MBH)	INPUT @6800 (MBH)	INPUT @6800 (ACFH)	INPUT @SL (MBH)	INPUT @6800 (MBH)		INPUT @6800 (ACFH)
	B-1	BOILER NO. 1	5,538	4,032	4,423	5,538	4,032	4,423	
	B-2	BOILER NO. 2	5,538	4,032	4,423	5,538	4,032	4,423	
	HWH-1	DOM. WATER HEATER (REMOVED)	1,255	914	1,002				
	GWH-1A	DOM. WATER HEATER (REPLACED)				500	445	488	4
	GWH-1B	DOM. WATER HEATER (REPLACED)				500	445	488	4
		<b>TOTAL LOAD</b>	<b>12,331</b>	<b>8,977</b>	<b>9,849</b>	<b>12,076</b>	<b>8,953</b>	<b>9,823</b>	

REMARKS

1. 6" GAS MAIN AT 14 PSI AND 70 L.F.
2. CAPACITIES ARE AT 6800' ABOVE SEA LEVEL.
3. PIPE SIZING BASED ON 2018 IFGC.
4. GAS LOAD REDUCED UNDER THIS PROJECT

**GAS CONNECTION DETAIL**  
NO SCALE

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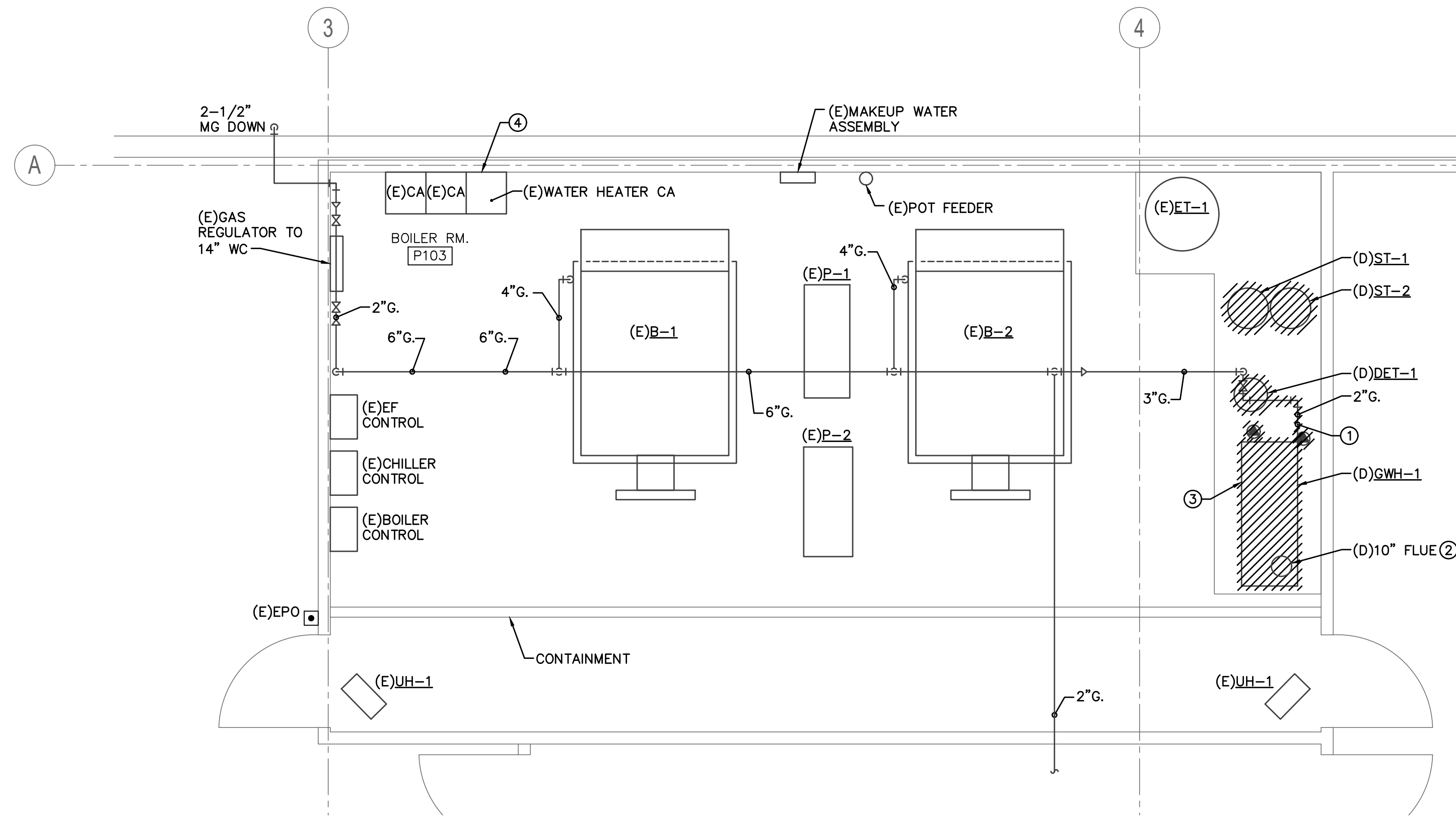
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**MUNICIPAL COURT BUILDING**  
**DWH REPLACEMENT**

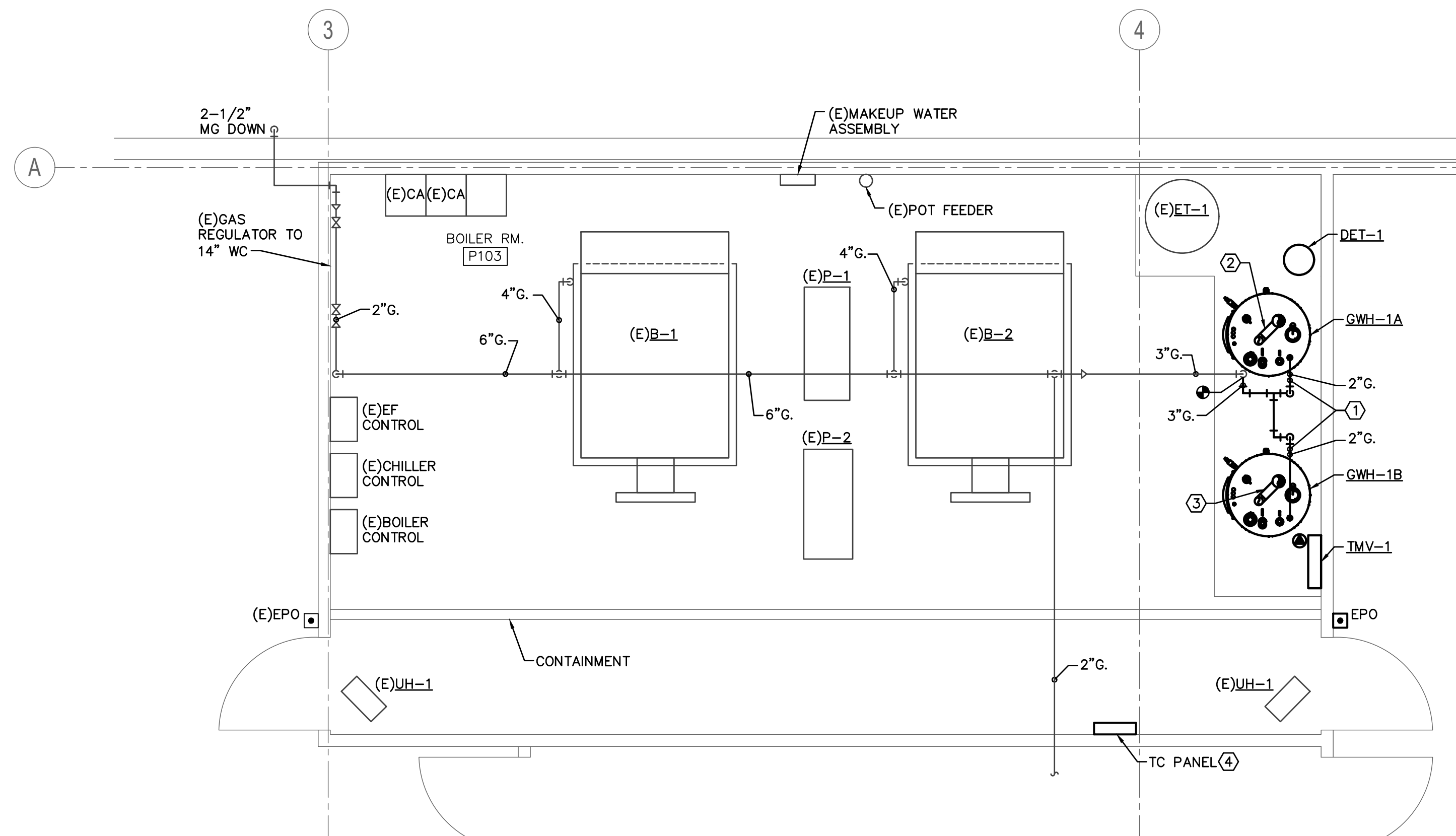
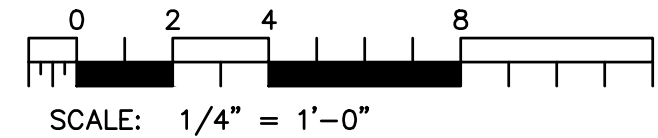
DESIGNED BY: LJB  
DRAWN BY: MES  
CHECKED BY: LJB  
PROJECT NO.: 23104  
DATE: 06/02/2023

**MECHANICAL GENERAL NOTES SCHEDULES AND DETAILS**

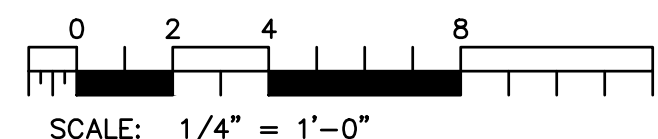
**M0.02**



**BOILER ROOM MECHANICAL DEMOLITION PLAN**



**BOILER ROOM MECHANICAL NEW WORK PLAN**



**GENERAL NOTES**

1. ALL ROOF WORK SHALL BE COORDINATED WITH CITY OF COLORADO SPRINGS AND PERFORMED BY AUTHORIZED ROOFING CONTRACTOR TO MAINTAIN ROOF WARRANTY.

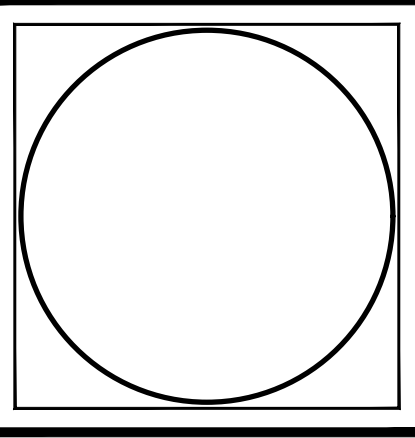
**DEMOLITION KEY NOTES**

- ① REMOVE THE GAS REGULATOR AND PIPING TO THE MAIN. PREPARE FOR THE NEW WORK GAS CONNECTION.
- ② REMOVE THE FLUE VENT PIPING AND SUPPORTS TO POINT SHOWN ON PLANS.
- ③ REMOVE EXISTING GAS FIRED DOMESTIC WATER HEATER & ST TANKS. REFER TO PLUMBING.
- ④ DISABLE EXISTING PNEUMATIC ACTUATOR FOR WATER HEATER COMBUSTION AIR DAMPER. LOCK DAMPER IN CLOSED POSITION.

**NEW WORK KEY NOTES**

- ① PROVIDE AND EXTEND THE EXISTING GAS CONNECTION WITH A NEW 3" HEADER AND 2" DROP TO EACH GAS FIRED DOMESTIC WATER HEATER. REFER TO DOMESTIC WATER PIPING DETAIL ON SHEET P5.01 AND GAS CONNECTION DETAIL ON SHEET M0.02 FOR ADDITIONAL REQUIREMENTS.
- ② PROVIDE 4" COMBUSTION AIR INTAKE AND 4" POLYPROPYLENE FLUE UP TO MANUFACTURER'S CONCENTRIC VENT KIT ON ROOF. SEAL ANNULAR SPACE AROUND CONCENTRIC VENT WATER AND WEATHER TIGHT. INSTALL PER MANUFACTURER'S INSTALLATION MANUAL. 12" MINIMUM BETWEEN VENTS AND 12" MINIMUM ABOVE COMBUSTION AIR LOUVER.
- ③ PROVIDE 4" COMBUSTION AIR INTAKE AND 4" POLYPROPYLENE FLUE UP TO MANUFACTURER'S CONCENTRIC VENT KIT ON ROOF. USE EXISTING OPENING. SEAL ANNULAR SPACE AROUND CONCENTRIC VENT WATER AND WEATHER TIGHT. INSTALL PER MANUFACTURER'S INSTALLATION MANUAL. 12" MINIMUM BETWEEN VENTS.
- ④ PROVIDE NEW JOHNSONS CONTROLS TEMPERATURE CONTROL PANEL. REFER TO P5.01 FOR CONTROL POINTS, SENSORS, CONTROLLERS, AND APPURTENANCES.

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**MUNICIPAL COURT BUILDING  
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DESIGNED BY	
DRAWN BY	
CHECKED BY	
PROJECT NO.	23104
DATE	06/02/2023

**BOILER ROOM  
MECHANICAL PLAN**

**M4.01**



**PLUMBING GENERAL NOTES:**

GENERAL PLUMBING REQUIREMENTS

1. PROVIDE ALL REQUIRED PERMITS, INSPECTIONS, AND COORDINATION WITH GOVERNING AUTHORITIES. THIS SHALL INCLUDE WALKING PROJECT THROUGH THE BUILDING DEPARTMENT. INSTALLATION SHALL COMPLY WITH ALL APPLICABLE CODES, TO INCLUDE:
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15. REPAIR ALL ACCIDENTAL OR INTENTIONAL DAMAGE, PLACES WHERE DEMOLITION HAS OCCURRED, AND WHERE NEW EQUIPMENT HAS BEEN INSTALLED TO MATCH EXISTING CONSTRUCTION WITH NO NOTICEABLE DIFFERENCE IN CONTINUITY, APPEARANCE, OR FUNCTION.
16. ALL PRODUCTS SHALL BE NEW AND UNDAMAGED, UNLESS NOTED OTHERWISE. CONTRACTOR SHALL REPLACE OR REPAIR ALL PRODUCTS TO NEW CONDITION, FOR EXAMPLE, DENTED CASINGS AND EQUIPMENT DOORS, DENTED AND BENT GRILLES, REGISTERS, AND DIFFUSERS, DENTED DUCTWORK, SCRATCHED PAINT, ETC.
17. WHEN PRODUCTS ARE SPECIFIED BY MANUFACTURER AND MODEL NUMBER, EQUIVALENT PRODUCTS BY OTHER MANUFACTURERS LISTED MAY BE PROVIDED. PRODUCT EQUIVALENCY SHALL BE DETERMINED BY ENGINEER. CONTRACTOR IS RESPONSIBLE FOR COORDINATION AND DESIGN OF SUBSTITUTED EQUIPMENT; THIS SHALL INCLUDE ADDITIONAL WEIGHT, PROPER FIT, AND ALL OTHER ASPECTS.
18. FIRE STOPPING REQUIREMENT. PENETRATIONS THRU RATED WALLS AND FLOORS SHALL BE SEALED WITH A MATERIAL CAPABLE OF PREVENTING THE PASSAGE OF FLAMES AND HOT GASSES WHEN SUBJECTED TO THE REQUIREMENTS OF THE TEST STANDARD SPECIFIC FOR FIRE STOPS ASTM-E-814. ACCEPTANCE MATERIALS INCLUDE: DOW CORNING RTV FIRE STOP FOAM FOR BARE PIPE, METAL CONDUIT, AND ELECTRICAL CABLE; 3M FIRE DAM 150 CAULK FOR BARE PIPE, METAL CONDUIT, AND BUILDING CONSTRUCTION GAPS; 3M FS-195 INTUMESCENT STRIPS FOR INSULATED PIPES, PLASTIC PIPE OR CONDUIT, AND ELECTRICAL CABLE.
19. NOTIFY ENGINEER ONE WEEK IN ADVANCE WHEN WORK ABOVE CEILING IS COMPLETE AND READY FOR ABOVE CEILING OBSERVATION. CONTRACTOR SHALL REMOVE CEILING AS REQUIRED FOR ENGINEER'S OBSERVATION.
20. SUBMIT MECHANICAL AND PLUMBING EQUIPMENT, MATERIALS, AND CONTROLS SUBMITTALS TO ARCHITECT/ENGINEER FOR REVIEW PRIOR TO ORDERING EQUIPMENT.
21. MAINTAIN A MARK-UP SET OF DRAWINGS WHICH INDICATE VARIATIONS IN THE ACTUAL INSTALLATION FROM THE ORIGINAL DESIGN. SUBMIT "AS-BUILT" DRAWINGS TO THE ARCHITECT/ENGINEER FOR REVIEW PRIOR TO FINAL PAY APPLICATION. DEVIATIONS SHALL BE APPROVED PRIOR TO SUBMITTING AS-BUILTS.
22. SUBMIT ELECTRONIC PDF OF OPERATION AND MAINTENANCE MANUALS AND WARRANTIES. SUBMIT TWO (2) HARD COPIES OF ALL OPERATION AND MAINTENANCE MANUALS AND WARRANTIES IN TABBED 3-RING BINDERS TO OWNER. O&M MANUALS SHALL BE PREPARED IN FULL COMPLIANCE WITH THE 2015 IECC 408.1.1 "BUILDING OPERATIONS AND MAINTENANCE INFORMATION". O&M MANUALS SHALL CONTAIN ALL TEAM CONTACTS, EMERGENCY CONTACTS, WARRANTY PROCEDURES, COMPREHENSIVE LIST OF EXTENDED WARRANTIES, COMPREHENSIVE FILTER SCHEDULE INDICATING SIZE AND TYPE OF FILTER FOR EACH PIECE OF EQUIPMENT, COMPREHENSIVE BELT SCHEDULE INDICATING SIZE AND TYPE OF BELTS FOR EACH PIECE OF EQUIPMENT, APPROVED SUBMITTALS, MANUFACTURERS' STARTUP REPORTS, TAB REPORT, CONTROLS, AND MANUFACTURERS' OPERATING MANUALS.
23. PROVIDE TRAINING FOR ALL SYSTEMS. APPROVED O&M'S SHALL BE USED FOR TRAINING. PROVIDE TRAINING AGENDA'S WITH NAME OF QUALIFIED TRAINER FOR ALL SYSTEMS. SUBMIT TRAINING ATTENDANCE SHEET FOR ALL TRAINING SESSIONS.
24. PROVIDE EMT CONDUIT FOR ALL EXPOSED LOW VOLTAGE AND CONTROL CABLING.
25. PAINT ALL EXPOSED CONDUIT, PIPING, AND DUCTWORK.
26. ISOLATE ALL PRESSURIZED PIPE (WATER, ETC.) AT EACH RISER, BRANCH, PIECE OF EQUIPMENT, AND AREA SERVED.

METERS AND GAGES:

1. THERMOMETERS: LIGHT POWERED DIGITAL IMMERSION WELL OR LIQUID FILLED GLASS FRONT IMMERSION WELL. WINTERS TSD OR EQUIVALENT. PROVIDE WHERE DEPICTED ON DRAWINGS AND ADJACENT TO TEMPERATURE SENSORS. PROVIDE P/T PORT ADJACENT TO THERMOMETER.
2. PRESSURE GAGES: GLYCERIN FILLED, 2.5" DIAL, LAMINATED GLASS, +/-1%. PROVIDE WHERE DEPICTED ON DRAWINGS AND ADJACENT TO PRESSURE SENSORS. PROVIDE P/T PORT ADJACENT TO GAGE.

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

1. DOMESTIC COLD AND HOT WATER: PROVIDE GALVANIZED CLEVIS OR TRAPEZE HANGERS. INSULATED PIPING 1.5" AND SMALLER SHALL HAVE SHEET METAL SHIELDS. HANGERS MAY NOT PENETRATE INSULATION, EXCEPT AT VERTICAL SUPPORTS.
2. DOMESTIC COLD AND HOT WATER PIPING 1.5" AND LARGER: PROVIDE GALVANIZED CLEVIS HANGERS AND 180 DEGREE CALCIUM SILICATE INSERTS WITH SHIELDS.
3. DOMESTIC COLD AND HOT WATER PIPING 1.5" AND LARGER: PROVIDE GALVANIZED TRAPEZE HANGERS AND 360 DEGREE CALCIUM SILICATE INSERTS WITH SHIELDS. PIPING SHALL BE FASTENED TO TRAPEZES HANGERS WITH CLAMP OVER INSERT.
4. SUPPORT GAS PIPING WITH GALVANIZED SWIVEL HANGERS OR CLEVIS HANGERS.
5. HANGERS AND SUPPORTS SHALL BE SIZED BY THE CONTRACTOR.

6. SUSPEND EACH TRADE'S WORK SEPARATELY FROM THE STRUCTURE.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

1. LABEL ALL EQUIPMENT WITH EQUIPMENT TAG FROM CONTRACT DOCUMENTS AND AS TO AREA SERVED.
2. LABEL PIPING AND ACCESS PANELS AS INDICATED ON DRAWINGS WITH ADHESIVE LABELS WITH 1.5" TALL LETTERS AND WITH FLOW ARROWS. LABELS SHALL BE ATTACHED TO PIPING EVERY 20 FEET. LABELS AND LETTERING COLOR SHALL CONFORM TO ANSII/ASME A13.1.
3. LABEL CEILING GRID BELOW EQUIPMENT WITH 0.5" TALL CLEAR ADHESIVE LABELS WITH BLACK LETTERS.
4. LABEL ALL CONTROL DEVICES WITH DEVICE NAME AND EQUIPMENT CONTROLLED. WITH 0.5" TALL CLEAR LABELS WITH BLACK LETTERS.
5. PROVIDE VALVE TAGS ON ALL PIPING MAIN ISOLATION VALVES.

PLUMBING PIPING INSULATION

1. REFER TO THE "PLUMBING INSULATION SCHEDULE" ON THE DRAWINGS FOR INSULATION TYPE, THICKNESS AND JACKETING REQUIREMENTS.
2. INSULATION SHALL BE CONTINUOUS OVER VALVES, PUMPS, STRAINERS, CHECK VALVES THAT ARE OVER 1" PER 2015 IECC C404.4.
3. INSULATION SHALL BE CONTINUOUS THROUGH WALLS AND HANGERS.
4. EXISTING INSULATION THAT IS DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED WITH INSULATION OF TYPE AND THICKNESS TO MATCH EXISTING.

DOMESTIC WATER PIPING

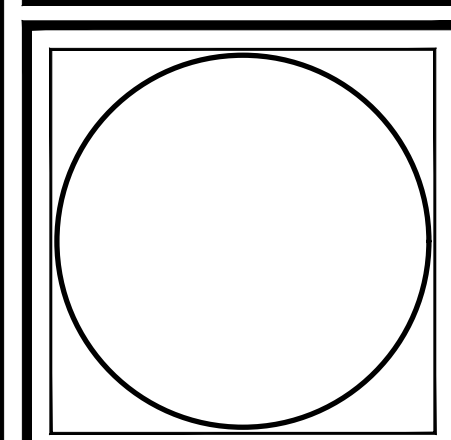
1. DOMESTIC HOT AND COLD WATER PIPING ABOVE GROUND SHALL BE TYPE L DRAWN TEMPER COPPER COMPLYING WITH ASTM B88 WITH SOLDERED OR BRAZED FITTINGS. PRO PRESS STYLE FITTINGS OR OTHER STYLE MECHANICAL FITTINGS ARE NOT ALLOWED. PULLED TEES AT BRANCH PIPING IS NOT ALLOWED.
2. PROVIDE DIELECTRIC NIPPLES BETWEEN DISSIMILAR MATERIALS.
3. PROVIDE FULL PORT BRONZE BALL VALVES WITH STAINLESS STEEL BALL AND STEM WITH EXTENDED STEMS.
4. PROVIDE ALL REQUIRED TESTS AND INSPECTIONS REQUIRED BY AHJ. PREPARE TEST AND INSPECTION REPORTS AND HAVE THEM SIGNED BY AHJ.
5. PROVIDE DOMESTIC WATER PIPING CLEANING AND DISINFECTING PRESCRIBED BY AHJ, AWWA C651 OR AWWA C652

DOMESTIC WATER HEATERS

1. SET DOMESTIC HOT WATER STORAGE TEMPERATURE AT 140°F.
2. SET DOMESTIC HOT WATER DISTRIBUTION TEMPERATURE AT 120°F.
3. SET RECIRCULATION TEMPERATURE AT 100°F

END

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REVISIONS


DESIGNED BY  
LJB

DRAWN BY  
MES

CHECKED BY  
LJB

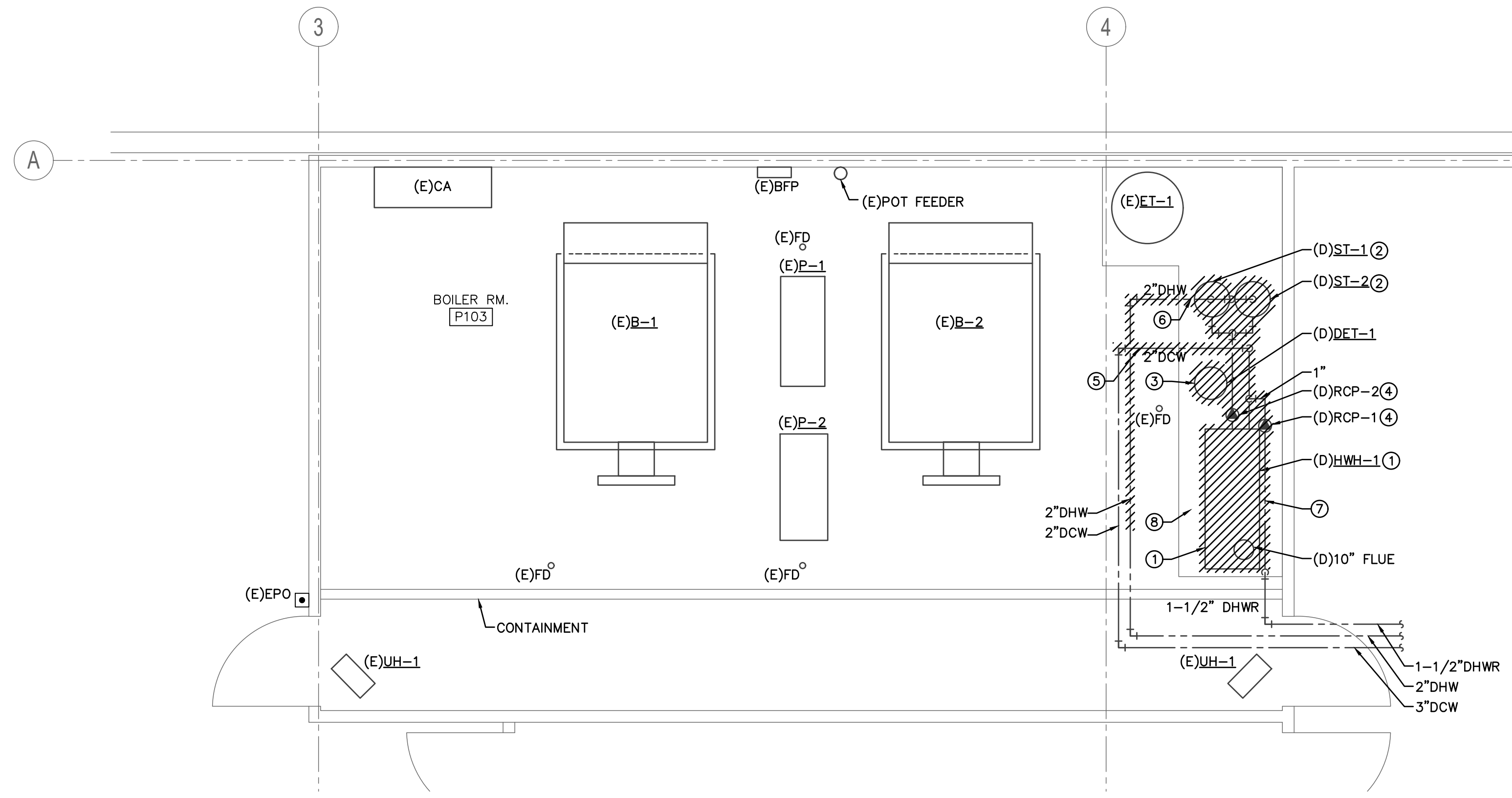
PROJECT NO.  
23104

DATE  
06/02/2023

SHEET TITLE  
PLUMBING  
GENERAL NOTES

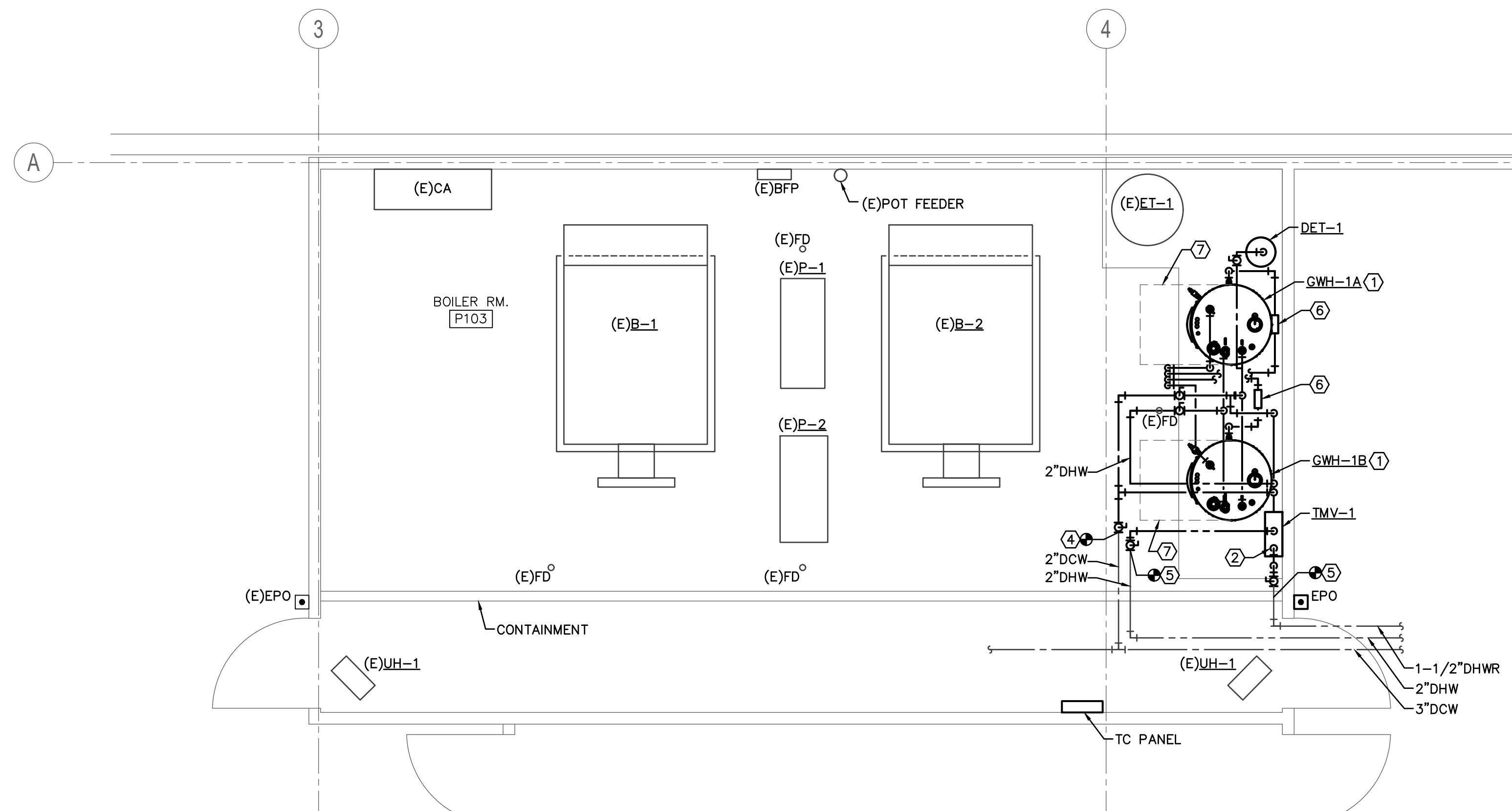
SHEET  
P0.02





**BOILER ROOM PLUMBING DEMOLITION PLAN**

SCALE: 1/4" = 1'-0"



**BOILER ROOM PLUMBING NEW WORK PLAN**

SCALE: 1/4" = 1'-0"

**DEMOLITION KEY NOTES**

- ① REMOVE THE DOMESTIC WATER HEATER AND ASSOCIATED APPURTENANCES.
- ② REMOVE DOMESTIC HOT WATER STORAGE TANKS, CIRCULATING PUMP, AND ASSOCIATED APPURTENANCES.
- ③ REMOVE DOMESTIC WATER EXPANSION TANK AND ASSOCIATED APPURTENANCES.
- ④ REMOVE THE DOMESTIC HOT WATER RECIRCULATION PUMP, ASSOCIATED PIPING AND APPURTENANCES. REMOVE PUMP SUPPORTS AND GRIND OFF ALL BOLTS/ANCHORS NOT BEING REUSED.
- ⑤ REMOVE THE DOMESTIC COLD-WATER PIPING AS SHOWN HATCHED AND PREPARE FOR THE NEW WORK CONNECTION.
- ⑥ REMOVE DOMESTIC HOT WATER PIPING AS SHOWN HATCHED AND PREPARE FOR THE NEW WORK CONNECTION.
- ⑦ REMOVE THE DOMESTIC HOT WATER RETURN PIPING AS SHOWN HATCHED AND PREPARE FOR THE NEW WORK CONNECTION.
- ⑧ EXISTING HOUSEKEEPING PAD TO BE REUSED. GRIND OFF ALL ANCHORS, BOLTS, OR OTHER PROTRUSIONS. CHEMICALLY CLEAN AND PAINT 2 INCHES OF EACH EDGE AND CORNERS WITH LOW VOC YELLOW OIL BASED PAINT AND REST OF PAD LOW VOC GRAY OIL BASED PAINT.

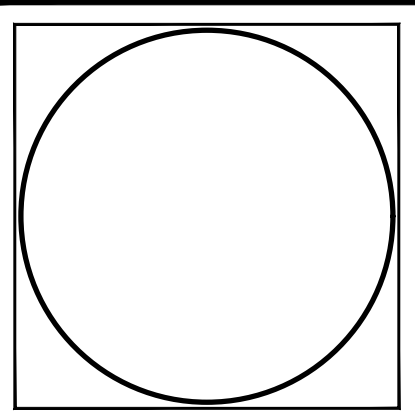
**NEW WORK KEY NOTES**

- ① PROVIDE GAS FIRED DOMESTIC WATER HEATER ON EXISTING HOUSEKEEPING PAD AS SHOWN. REFER TO DOMESTIC WATER PIPING DETAIL ON SHEET P5.01 FOR ADDITIONAL REQUIREMENTS.
- ② PROVIDE DOMESTIC HOT WATER RECIRCULATION PUMP, PIPING, AND APPURTENANCES. REFER TO DOMESTIC WATER PIPING DETAIL ON SHEET P5.01 FOR ADDITIONAL REQUIREMENTS.
- ③ PROVIDE DOMESTIC EXPANSION TANK (DET-1) ON THE EXISTING HOUSEKEEPING PAD. DO NOT SUPPORT FROM PIPING. REFER TO DOMESTIC WATER PIPING DETAIL ON SHEET P5.01 FOR ADDITIONAL REQUIREMENTS.
- ④ PROVIDE DOMESTIC COLD WATER PIPING AND CONNECTIONS. REFER TO DOMESTIC WATER PIPING DIAGRAM ON SHEET P5.01 FOR PIPE SIZES AND ADDITIONAL REQUIREMENTS.
- ⑤ PROVIDE DOMESTIC HOT WATER AND HOT WATER RECIRCULATION PIPING AND CONNECTIONS. REFER TO DOMESTIC WATER PIPING DIAGRAM ON SHEET P5.01 FOR PIPE SIZES AND ADDITIONAL REQUIREMENTS.
- ⑥ PROVIDE MANUFACTURERS CONDENSATE NEUTRALIZER, PRESSURE RELIEF PIPING, CONDENSATE DRAIN PIPING, AND TERMINATE PIPING WITH ELBOWS DIRECTING ALL FLOW EXISTING FLOOR DRAIN. REFER TO DOMESTIC WATER PIPING DETAIL ON SHEET P-5.01 FOR ADDITIONAL REQUIREMENTS.
- ⑦ PROVIDE 24" SERVICE CLEARANCE TO THE FRONT AND LEFT OF THE DOMESTIC WATER HEATERS. REFER TO MANUFACTURERS INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR ADDITIONAL REQUIREMENTS.

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PROJECT NO.	23104
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**BOILER ROOM  
PLUMBING PLAN**

**P4.01**



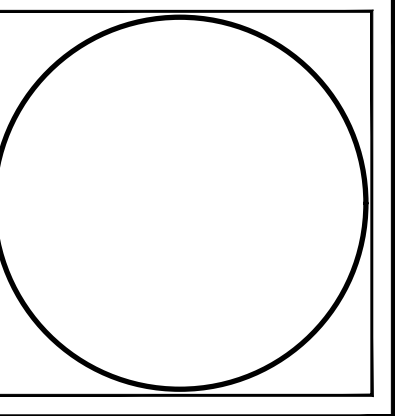
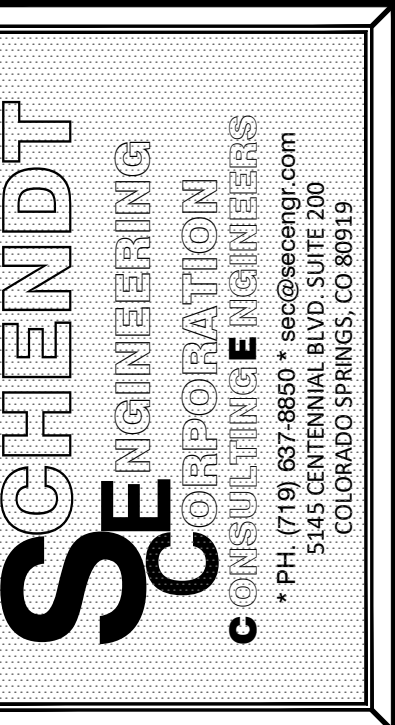
GAS WATER HEATER SCHEDULE			
MARK	HWH-1 (DEMO)	GWH-1A	GWH-1B
MANUFACTURER	LOCHNIVAR	LOCHNIVAR	LOCHNIVAR
MODEL NO.	CWN1255PM	SWA500N	SWA500N
SERIAL NO.	A971091		
LOCATION	MECH ROOM	MECH ROOM	MECH ROOM
SITE ELEVATION		6,800	6,800
GAS INPUT (MBH)	1255	500	500
GAS TYPE	NATURAL GAS	NATURAL GAS	NATURAL GAS
GAS INLET PRESS. RANGE("W.C.)	5-10.5	4-14	4-14
RECOVERY RATE 100F (GPH)	1239	582	582
NOMINAL CAPACITY (GAL.)	NA	110	110
RATED CAPACITY (GAL.)	NA	110	110
THERMAL EFFICIENCY (%)	80	96	96
ELECTRICAL REQUIREMENTS			
VOLTS	120	120	120
PHASE	1	1	1
HERTZ	60	60	60
AMPS	12	7	7
DIMENSIONS			
HEIGHT (IN.)		79 1/2	79 1/2
DIAMETER (IN.)		34	34
SERVICE CLR FRONT & LEFT (IN.)		24	24
SERVICE CLR TOP (IN.)		18	18
CONNECTIONS			
GAS (IN.)		1	1
VENT SIZE (IN.)		4	4
AIR INLET (IN.)		4	4
WATER CONN. (IN.)		1 1/2	1 1/2
RELIEF 1 SIZE (IN.)		1	1
RELIEF 2 SIZE (IN.)		3/4	3/4
SHIPPING WEIGHT (LBS)	5170	875	875
OPERATING WEIGHT (LBS)		1800	1800
REMARKS	1	2-9	2-9
REMARKS:			
1. EXISTING WATER HEATER TO BE REPLACED.			
2. REPLACEMENT WATER HEATER TO BE INSTALLED.			
3. REFER TO THE DOMESTIC EXPANSION TANK SCHEDULE FOR DOMESTIC HOT WATER EXPANSION TANK.			
4. PROVIDE WITH CONDENSATE NEUTRALIZATION KIT AND LOW WATER CUTOFF			
5. PROVIDE WITH TAMPER RESISTANT BRASS DRAIN VALVE.			
6. PROVIDE WITH DIRECT VENT WATER HEATER WITH CONCENTRIC VENT KIT.			
7. PROVIDE POLYPROPYLENE CATEGORY IV VENTING PER SPECIFICATIONS AND PLANS			
8. PROVIDE ASME RATED HIGH ALTITUDE MODEL.			
9. PROVIDE WITH BACNET COMMUNICATIONS			

DOMESTIC HOT WATER EXPANSION TANK SCHEDULE		
MARK	DET-1	DET-1
LOCATION	MECH RM.	MECH RM.
MANUFACTURER	AMTROL	AMTROL
MODEL NO.	ST-42VC-DD	ST-42VC-DD
YEAR MANUFACTURED	2012	NA
WATER HEATER STORAGE CAPACITY (GAL)	220	220
EXPANSION TANK		
TANK VOLUME (GAL.)	23	23
ACCEPTANCE VOL. (GAL.)	11.3	11.3
FACTORY PRECHARGE (PSIG)	55	55
SYSTEM OPERATING PRESSURE (PSIG)	60	60
MAXIMUM DESIGN PRESSURE (PSIG)	150	150
MAXIMUM DESIGN TEMPERATURE (F)	200	200
DIMENSIONS		
HEIGHT (IN.)	33	33
DIAMETER (IN.)	15	15
CONNECTION SIZE (IN)	3/4	3/4
SHIPPING WEIGHT (LB)	68	68
OPERATING WEIGHT (LB)	162	162
REMARKS	1	1-4
REMARKS:		
1. EXISTING EXPANSION TANK TO BE REMOVED.		
2. NEW DOMESTIC HOT WATER EXPANSION TANK TO BE PROVIDED AND INSTALLED.		
3. HEAVY DUTY BUTYL FIXED DIAPHRAGM		
4. EXPANSION TANK SHALL BE DESIGNED TO FOLLOW ASHRAE 188 ANTI-LEGIONELLA GUIDELINES.		
5 STAINLESS STEEL SYSTEM CONNECTION AND POLYPROPYLENE LINER		

DHW RECIRCULATION PUMP SCHEDULE			
MARK	RCP-1	RCP-2	DHWP-1
LOCATION	MECH ROOM	MECH ROOM	MECH ROOM
SERVICE	STORAGE	RECIRCULATION	RECIRCULATION
PUMP DATA			
MANUFACTURER	B&G	TACO	TACO
MODEL NO.	LD-3	0011-F4	0034E-SF2
TYPE	INLINE	INLINE	INLINE
SERIAL NO.			
FLOW (GPM)	17	10	10
HEAD (FT)	13	15	20
SPEED (RPM)		3,250	830-4300
MOTOR DATA			
MANUFACTURER	B&G	TACO	TACO
HORSEPOWER	1/2	1/8	1/4
FRAME SIZE	56Z		
SPEED (RPM)	1,625	3,250	830-4300
VOLTS	115		115/208-230
PHASE	1	1	1
HERTZ	60	60	60
FULL LOAD AMPS	5	1.76	1.48
SERVICE FACTOR	1.25	#VALUE!	-
DUTY	CONT.	CONT.	CONT
REMARKS:	1	1	2
REMARKS:			
1. EXISTING PUMP TO BE REMOVED			
2. PROVIDE ECM/DIGITAL DHW STAINLESS STEEL INLINE PUMP			

PLUMBING INSULATION SCHEDULE								
PLUMBING SYSTEMS TO BE INSULATED	TEMPERATURE RANGE (°F)	PIPE SIZE	INSULATION MATERIAL	INSULATION FORM	INSULATION THICKNESS (INCHES)	R-VALUE (BTU/HR-SF-F)	VAPOR BARRIER REQUIRED	REMARKS
PIPING SYSTEM								
DOMESTIC COLD WATER	ALL	1/2" TO 1-1/4"	FIBERGLASS	PIPE	0.5	2.2	YES	2,3,4
DOMESTIC COLD WATER	ALL	1-1/2" & LARGER	FIBERGLASS	PIPE	1	4.3	YES	2,3,4
DOMESTIC HOT WATER	ALL	1/2" TO 1-1/4"	FIBERGLASS	PIPE	1	4.2	NO	2,3,4
DOMESTIC HOT WATER	ALL	1-1/2" TO 4"	FIBERGLASS	PIPE	1.5	6.3	NO	2,3,4
EXISTING PIPING AND EQUIPMENT INSULATION								
EXISTING PIPE INSULATION REPAIR	ALL	ALL						1
REMARKS:								
1. EXISTING INSULATION THAT HAS BEEN DAMAGED SHALL BE REPLACED WITH INSULATION TYPE AND THICKNESS TO MATCH EXISTING.								
2. INSULATION SHALL HAVE AN ALL-SERVICE-JACKET								
3. PIPE FITTING INSULATION SHALL BE MITERED AND SEALED WITH MASTIC OR COVERED WITH PVC FITTING COVERS.								
4. INSULATION SHALL HAVE A FLAME SPREAD/SMOKE DEVELOPED RATING OF 25/50 WHEN INSTALLED IN RETURN AIR PLENUMS.								

MIXING VALVE SCHEDULE							
TAG	DESCRIPTION	FIXTURE		CONNECTIONS			
		MANF	MODEL	CW	HW	HWR	OUTLET
TMV-1	COMPLETE WATER TEMPERATURE CONTROL STATION. WALL MOUNT, FULL PORT BALL VALVES, TEST CONNECTION, CIRCUIT SETTER, BALANCING VALVE, THERMOMETERS, PRESSURE GAUGE, PUMP SHUT OFFS, CIRCULATOR POWER SWITCH,GFCI CONVENIENCE OUTLET, FLAPPER CHECKS, TACO DIGITAL ECM PUMP. NEXT GEN HIGH LOW ECO MIX THERMOSTATIC MIXING VALVE.	LEONARD	5NB-LF	1 1/4	1 1/4	1	1 1/2



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LJB

PROJECT NO.  
23104

DATE  
06/02/2023

SHEET TITLE  
PLUMBING SCHEDULES

SHEET NO.  
P6.01

ONE - LINE SYMBOLS	
	CIRCUIT BREAKER XXXAT - TRIP RATING XXXAF - FRAME RATING
	SAFETY DISCONNECT
	FUSED DISCONNECT
	STARTER
	COMBINATION/STARTER DISCONNECT
	FUSED SWITCH - (600V & BELOW) XXXAF - FUSE RATING XXXAS - SWITCH RATING
	FUSED SWITCH - (ABOVE 600V)
	TRANSFORMER: DELTA CONNECTION WYE CONNECTION
	SURGE ARRESTOR
	GROUND CONNECTION (SIZE AS INDICATED)
	MOTOR, # INDICATES HORSEPOWER
	GENERATOR
	BUS IDENTIFICATION NUMBER
	FEEDER SIZE (REFER TO FEEDER SCHEDULE)
	FUSED POTENTIAL TRANSFORMER
	CURRENT TRANSFORMER
	AUTOMATIC TRANSFER SWITCH
	MISCELLANEOUS LOAD
	PANELBOARD
	SPD - SURGE PROTECTIVE DEVICE
	BUS BAR (ENCLOSED)
	UPS UNIT WITH BATTERY
	KWH METER
	POWER MONITOR
	SHUNT TRIP
	SEPARABLE CONNECTION - MEDIUM VOLTAGE
	DRAWOUT BREAKER
	DRAWOUT AIR BREAKER

POWER SYMBOLS	
	SIMPLEX RECEPTACLE
	DUPLEX RECEPTACLE
	RECEPTACLE FUNCTIONS: (TYPICAL) G - GROUND FAULT CIRCUIT INTERRUPTER L - LOCKING TYPE, WEATHER PROOF COVER WP - WEATHERPROOF # - NUMBER INDICATES CIRCUIT NUMBER (WHERE APPLICABLE) IG - ISOLATED GROUND AC - ABOVE COUNTER
	COMBINATION DUPLEX RECEPTACLE AND DUAL 30W USB PORTS
	DOUBLE DUPLEX RECEPTACLE
	SPECIAL RECEPTACLE (SIZE AND TYPE AS INDICATED BY NEMA NO.)
	RECEPTACLE PROTECTED BY GFCI DEVICE
	SWITCHED DUPLEX RECEPTACLE 1/2 SWITCHED, 1/2 NON SWITCHED
	FLOOR OR CEILING BOX DUPLEX RECEPTACLE (C - IMPLIES CEILING)
	FLOOR OR CEILING BOX DOUBLE DUPLEX RECEPTACLE (C - IMPLIES CEILING)
	FLOOR OR CEILING BOX SPECIAL RECEPTACLE SIZE AND TYPE AS INDICATED BY NEMA NO. (C - IMPLIES CEILING)
	COMBINATION POWER/COMMUNICATIONS FLOOR BOX (RECEPTACLES AS INDICATED)
	COMBINATION POWER/COMMUNICATIONS FLOOR BOX FOR SYSTEMS FURNITURE
	CLOCK RECEPTACLE
	4" SQUARE JUNCTION BOX WITH BLANK COVER UNLESS OTHERWISE NOTED
	LARGE JUNCTION BOX. SIZE AS NOTED
	POWER POLE SYSTEMS FURNITURE
POWER SYSTEMS	
	SERVICE AND DISTRIBUTION EQUIPMENT MDP - MAIN DISTRIBUTION PANEL MCC - MOTOR CONTROL CENTER ATS - AUTOMATIC TRANSFER SWITCH UPS - UNINTERRUPTIBLE POWER SUPPLY SDP - SUB DISTRIBUTION PANEL ST - SHUNT TRIP
	STARTER
	SAFETY DISCONNECT
	FUSED DISCONNECT
	COMBINATION STARTER/DISCONNECT
	TRANSFORMER
BRANCH CIRCUIT PANELBOARDS	
	PANELBOARD (NEW)
	PANELBOARD (EXISTING)
LIGHTNING PROTECTION & GROUNDING	
	AIR TERMINAL
	GROUND ROD
	GROUND ROD WITH INSPECTION WELL AND COVER
#4/0 ground ring conductor symbol"/>	#4/0 GROUND RING CONDUCTOR
#1/0 roof conductor symbol"/>	#1/0 ROOF CONDUCTOR
	EXOTHERMIC WELD
	GROUND BAR
GENERAL SYMBOLS	
(D)	DEMOLISH
(E)	EXISTING
(N)	NEW
(R)	RELOCATED
(F)	FUTURE
(TR)	TO REMAIN
(TYP.)	TYPICAL
(X)	DRAWING KEYNOTE (APPLIES TO ENTIRE SHEET WHEN SHOWN UNDER PLAN TITLE)
(X)	DEMOLITION KEYNOTE (APPLIES TO ENTIRE SHEET WHEN SHOWN UNDER PLAN TITLE)
	REVISION CALL-OUT
	EQUIPMENT IDENTIFIER
	LIGHT LINE - EXISTING
	HEAVY LINE - NEW WORK
	HATCHING INDICATES DEMOLITION WORK EXISTING CONDITIONS TO BE REMOVED

GENERAL DEMOLITION NOTES	
(APPLY TO ALL ELECTRICAL DEMOLITION SHEETS)	
1. THE OWNER OR ITS REPRESENTATIVE MAY CHOOSE TO KEEP ANY OR ALL OF THE COMPONENTS WHICH ARE REMOVED AND NOT REUSED AS PART OF THIS PROJECT. MATERIALS WHICH ARE NOT RECLAIMED BY THE OWNER SHALL BE PROPERLY DISPOSED OF BY THE CONTRACTOR, OFF OF THE OWNER'S PROPERTY.	
2. THE CONTRACTOR SHALL COMPLETELY REMOVE ALL ELECTRICAL WIRING, CONDUIT, BOXES, DEVICES, DISCONNECTS, FIXTURES, MOUNTING HARDWARE, ETC. WHICH ARE ASSOCIATED WITH THE EQUIPMENT INDICATED BY HATCHING UNLESS OTHERWISE NOTED.	
3. THE EQUIPMENT SHOWN AS HATCHED ON THE DRAWINGS REPRESENT THE MAJORITY OF THE EQUIPMENT TO BE REMOVED. IT DOES NOT NECESSARILY SHOW ALL THE ASSOCIATED HARDWARE SUCH AS CONDUIT, BOXES, WIRING, ETC.	
4. THE CONTRACTOR SHALL COORDINATE AND SCHEDULE ALL NECESSARY POWER OUTAGES WITH THE OWNER'S REPRESENTATIVE PRIOR TO PROCEEDING WITH SUCH WORK. THE CONTRACTOR SHALL INSURE THAT THE OPERATIONS IN ADJACENT AREAS OR PORTIONS OF THE FACILITY ARE NOT INTERRUPTED OR RESTRICTED WITHOUT PRIOR APPROVAL.	
GENERAL NOTES	
(APPLY TO ALL ELECTRICAL SHEETS)	
1. ALL CONDUITS AND OTHER CONVEYANCES SHALL BE SURFACE MOUNTED IN MECHANICAL/ELECTRICAL SPACES TO MATCH EXISTING.	
2. SIZES OF WIRE AND CABLES ARE BASED ON COPPER CONDUCTORS, UNLESS INDICATED OTHERWISE.	
3. ALL PENETRATIONS IN OR THROUGH FIRE RATED PARTITIONS SHALL BE FIRE STOPPED SUCH THAT THE PENETRATION MEETS OR EXCEEDS THE FIRE RATING OF THE WALL.	
4. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL COORDINATION BETWEEN THE APPROPRIATE DISCIPLINES AND CONTRACTORS.	
5. COORDINATE ALL DEVICE, FIXTURE AND HARDWARE COLOR SELECTIONS PRIOR TO MAKING SHOP DRAWING SUBMITTALS.	
6. BRANCH CIRCUIT AND SPECIAL SYSTEMS WIRING FOR DEVICES ON WALLS IN FINISHED AREAS WHICH CANNOT BE CONCEALED SHALL BE INSTALLED IN SURFACE MOUNTED RACEWAY. EXPOSED CONDUIT IS NOT ACCEPTABLE IN FINISHED SPACES. PRIOR APPROVAL IS REQUIRED BEFORE MOUNTING CONVEYANCES IN AN EXPOSED FASHION.	
7. ALL EXPOSED CONDUITS, BOXES, ETC. IN ROOMS TO BE PAINTED SHALL BE PAINTED TO MATCH THE SURROUNDING SURFACE. EXPOSED CONDUIT, BOXES, ETC. IN ROOMS WHICH ARE NOT PAINTED MAY BE LEFT UN-PAINTED. EXPOSED CONDUIT, BOXES, ENCLOSURES, ETC. ON THE EXTERIOR OF BUILDINGS SHALL BE PAINTED TO MATCH THE SURROUNDING SURFACES.	
8. THE CONTRACTOR IS RESPONSIBLE FOR PATCHING, PAINTING, REPAIRING OR THE REPLACEMENT OF ALL WALLS, CEILINGS OR OTHER BUILDING ELEMENTS WHICH ARE DISTURBED AS PART OF THE DEMOLITION AND/OR INSTALLATION OF ELECTRICAL WORK.	
9. REFER TO THE MECHANICAL DRAWINGS AND SCHEDULES FOR ADDITIONAL REQUIREMENTS ASSOCIATED WITH PLUMBING AND HVAC EQUIPMENT.	
CIRCUITING SYMBOLS	
	PROVIDE A MINIMUM WIRE SIZE OF #12 CONDUCTORS IN 3/4" C. PROVIDE 1 PHASE CONDUCTOR FOR EACH BRANCH CIRCUIT. NEUTRAL AND GROUND CONDUCTORS MAY BE SHARED AMONGST MULTIPLE BRANCH CIRCUITS WITHIN A COMMON CONDUIT UNLESS THE CIRCUITS SUPPLY ELECTRONIC/COMPUTER LOADS. DEDICATED NEUTRALS AND GROUNDS SHALL BE PROVIDED FOR ELECTRONIC/COMPUTER LOADS AND FOR CIRCUITS WITH GFCI TYPE RECEPTACLES.
	RACEWAY CONCEALED ABOVE CEILING OR IN WALL, EXPOSED IN EQUIPMENT ROOMS OR UNFINISHED SPACES.
	RACEWAY UNDERGROUND OR UNDERFLOOR
	RACEWAY UP
	RACEWAY DOWN
	RACEWAY CHANGE IN ELEVATION
	CAPPED CONDUIT
	CABLE TRAY (SIZE AS INDICATED)
	FLEXIBLE CONDUIT CONNECTION (LIQUIDTIGHT)
	SURFACE MOUNTED RACEWAY (WIREMOLD) (DEVICES AS INDICATED)
	PLUG AND CORD SEC.
	HOME RUN CONDUIT, SIZE AS INDICATED
	EMERGENCY BRANCH CIRCUIT (#10 WIRE MINIMUM)

ABBREVIATIONS			
ABB	DESCRIPTION	ABB	DESCRIPTION
ABB	AMPERE	P	PHASE, POLE, OR POWER
AC	ALTERNATING CURRENT	PA	PUBLIC ADDRESS
ACB	AIR CIRCUIT BREAKER	Ø	Ø PHASE
AF	AMPERE FRAME, FUSE	Ø	Ø PLC
AFC	ABOVE FINISHED CEILING	PLC	PROGRAMMABLE LOGIC CONTROLLER
AFB	ABOVE FINISHED FLOOR	PB	PUSH BUTTON
AIC	AMPS INTERRUPTING CAPACITY	PF	POWER FACTOR
AL	ALUMINUM	PIN	PERSONAL IDENTIFICATION NUMBER
ANN	ANNUNCIATOR	PIV	POST INDICATOR VALVE
ARF	ABOVE RAISED FLOOR	PNL	PANEL
AS	AMMETER SWITCH	PTZ	PAN/TILT/ZOOM
AT	AMP TRIP	PVC	POLYVINYL CHLORIDE
ATS	AUTOMATIC TRANSFER SWITCH	QTY	QUANTITY
BFF	BELOW FINISHED FLOOR	RCPT	RECEPTACLE
BRKR	BREAKER	REF	REFERENCE DIMENSION FROM ARCHITECTURAL DRAWINGS (ELEVATION OF FIRST FLOOR)
BLDG	BUILDING	RM	ROOM
C	CONDUIT	RQD	REQUIRED
CB	CIRCUIT BREAKER	RVNR	REDUCED VOLTAGE NONREVERSING
CATV	CABLE TELEVISION	RVR	REDUCED VOLTAGE REVERSING
CCTV	CLOSED-CIRCUIT TELEVISION	RX	RECEIVER
CER	COMMUNICATIONS EQUIPMENT ROOM	SACP	SECURITY ALARM CONTROL PANEL
CKT	CIRCUIT	SMR	SURFACE MOUNTED RACEWAY (WIREMOLD CONVEYANCE)
CO/COR	CONTRACTING OFFICER/CONTRACTING OFFICERS REPRESENTATIVE	SPKR	SPEAKER
CR	CONTROL POWER TRANSFORMER	SS	STAINLESS STEEL
CRS	CONTROL RELAY	STR	STARTER
CT	COATED RIGID STEEL CURRENT TRANSFORMER	SURF	SURFACE
DACT	DIGITAL ALARM COMMUNICATION TRANSMITTER	SW	SWITCH
DIA	DIAMETER	SWBD	SWITCHBOARD
DC	DIRECT CURRENT	SWGR	SWIRGEAR
DIV	DIVISION	SYMM	SYMMETRICAL
Δ	DELTA CONNECTED	EC	ELECTRICAL CONTRACTOR
EC	ELECTRICAL CONTRACTOR	EES	EARTH ELECTRODE SYSTEM
EES	EARTH ELECTRODE SYSTEM	ELCU	EMERGENCY LIGHTING CONTROL UNIT
EMH	ELECTRICAL MANHOLE	ENT	ELECTRICAL NONMETALLIC TUBING
EMT	ELECTRICAL METALLIC TUBING	EOL	END OF LINE RESISTOR
ENT	ELECTRICAL NONMETALLIC TUBING	EPO	EMERGENCY POWER OFF
EOL	END OF LINE RESISTOR	EWC	ELECTRIC WATER COOLER
EPO	EMERGENCY POWER OFF	F.O.	FIBER OPTIC
EWC	ELECTRIC WATER COOLER	FA	FIRE ALARM
F.O.	FIBER OPTIC	FACP	FIRE ALARM CONTROL PANEL FURNISHED BY OTHERS
FA	FIRE ALARM	FBO	FEDER
FACP	FIRE ALARM CONTROL PANEL FURNISHED BY OTHERS	FDR	FLOOR
FBO	FEDER	FLR	FACILITY MONITORING & CONTROL SYSTEM
FDR	FLOOR	FMCS	FULL VOLTAGE NONREVERSING FULL VOLTAGE REVERSING
FLR	FACILITY MONITORING & CONTROL SYSTEM	FNR	FNR
FMCS	FULL VOLTAGE NONREVERSING FULL VOLTAGE REVERSING	FVR	FVR
FNR	FNR	G	GROUND
FVR	FVR	GC	GENERAL CONTRACTOR
G	GROUND	GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GC	GENERAL CONTRACTOR	GFR	GROUND FAULT RELAY
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	GRC	GALVANIZED RIGID CONDUIT
GFR	GROUND FAULT RELAY	HH	HANDHOLE
GRC	GALVANIZED RIGID CONDUIT	HID	HIGH-INTENSITY DISCHARGE
HH	HANDHOLE	HOA	HAND-OFF-AUTO
HID	HIGH-INTENSITY DISCHARGE	IAW	IN ACCORDANCE WITH
HOA	HAND-OFF-AUTO	ICCB	INSULATED CASE CIRCUIT BREAKER
IAW	IN ACCORDANCE WITH	IMC	INTERMEDIATE METALLIC CONDUIT
ICCB	INSULATED CASE CIRCUIT BREAKER	I/O	INPUT-OUTPUT
IMC	INTERMEDIATE METALLIC CONDUIT	JB	JUNCTION BOX
I/O	INPUT-OUTPUT	K	KEY INTERLOCK
JB	JUNCTION BOX	KA	KILOAMPERE
K	KEY INTERLOCK	KVA	KILOVOLT-AMPERE
KA	KILOAMPERE	KVAR	KILOVOLT-AMPERE REACTIVE
KVA	KILOVOLT-AMPERE	KW	KILOWATT
KVAR	KILOVOLT-AMPERE REACTIVE	KWH	KILOWATT HOUR
KW	KILOWATT	LAN	LOCAL AREA NETWORK
KWH	KILOWATT HOUR	LFMC	LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT
LAN	LOCAL AREA NETWORK	LPS	LIGHTNING PROTECTION SYSTEM
LFMC	LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT	LV	LOW VOLTAGE
LPS	LIGHTNING PROTECTION SYSTEM	MC	MECHANICAL CONTRACTOR
LV	LOW VOLTAGE	MCB	MAIN CIRCUIT BREAKER
MC	MECHANICAL CONTRACTOR	MCC	MOTOR CONTROL CENTER
MCB	MAIN CIRCUIT BREAKER	MCCB	MOLDED CASE CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER	MCER	MAIN COMMUNICATIONS EQUIPMENT ROOM
MCCB	MOLDED CASE CIRCUIT BREAKER	MCP	MOTOR CIRCUIT PROTECTOR
MCER	MAIN COMMUNICATIONS EQUIPMENT ROOM	MFR	MANUFACTURER
MCP	MOTOR CIRCUIT PROTECTOR	MH	MANHOLE
MFR	MANUFACTURER	MLO	MAIN LUGS ONLY
MH	MANHOLE	MTD	MOUNTED
MLO	MAIN LUGS ONLY	MTS	MANUAL TRANSFER SWITCH
MTD	MOUNTED	MUX	MULTIPLEXER
MTS	MANUAL TRANSFER SWITCH	NC	NEUTRAL
MUX	MULTIPLEXER	NCC	NORMALLY CLOSED
NC	NEUTRAL	NEC	NATIONAL ELECTRICAL CODE
NCC	NORMALLY CLOSED	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NEC	NATIONAL ELECTRICAL CODE	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION	NIC	NOT IN CONTRACT
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION	NL	NIGHT LIGHT
NIC	NOT IN CONTRACT	NO	NORMALLY OPEN
NL	NIGHT LIGHT	NP	NAMEPLATE
NO	NORMALLY OPEN	NTS	NOT TO SCALE
NP	NAMEPLATE	OC	ON CENTER
NTS	NOT TO SCALE	OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OC	ON CENTER	OFOI	OWNER FURNISHED, OWNER INSTALLED
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED	OHP	OVERHEAD PROJECTOR
OFOI	OWNER FURNISHED, OWNER INSTALLED	OL	OVERLOAD RELAY
OHP	OVERHEAD PROJECTOR		
OL	OVERLOAD RELAY		

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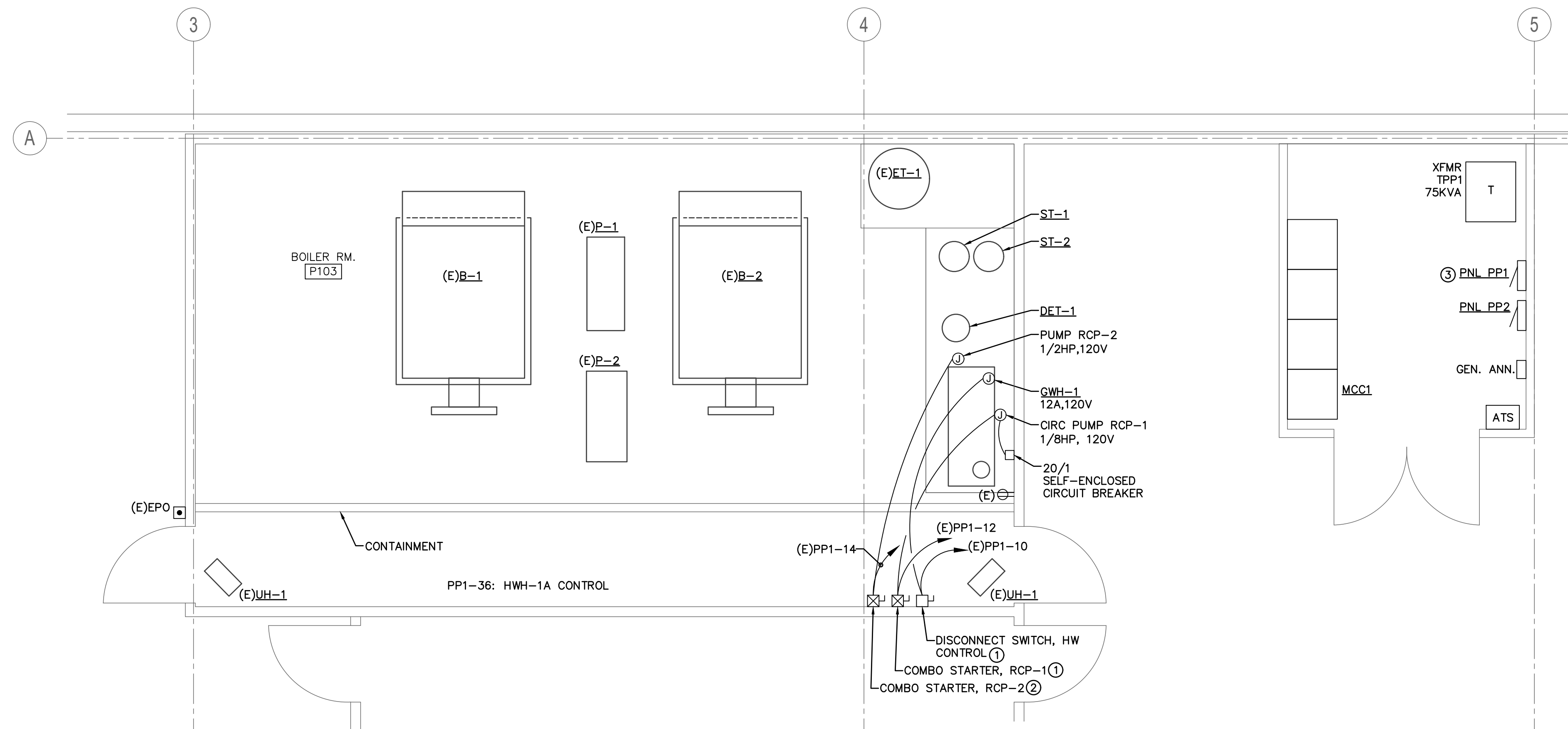
**MUNICIPAL COURT BUILDING  
DWH REPLACEMENT**

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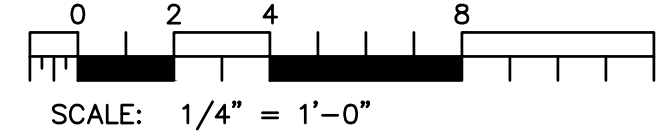
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CHECKED BY: MES  
DESIGNED BY: LJB  
DATE: 06/02/2023  
SHEET TITLE: ELECTRICAL LEGEND & GENERAL NOTES

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**E0.01**



BOILER ROOM POWER DEMOLITION PLAN

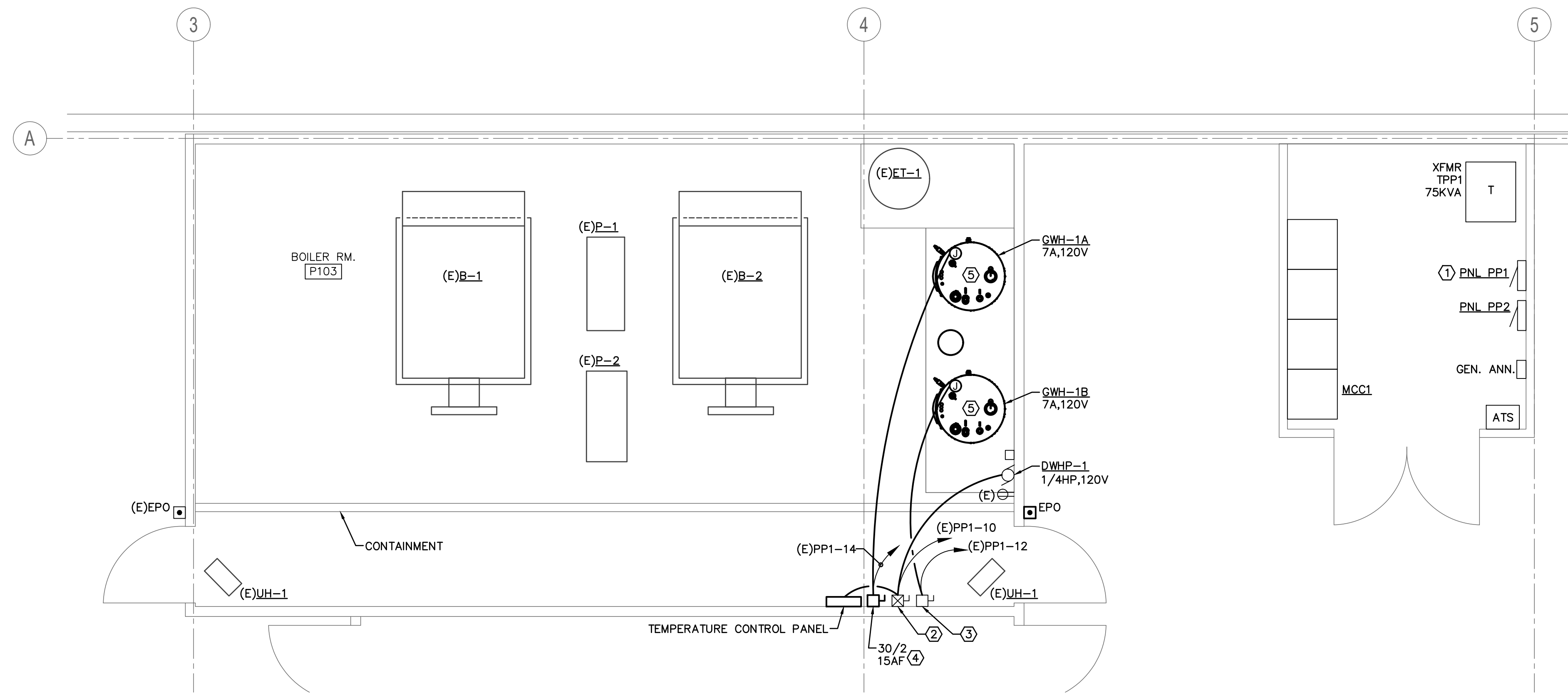


**GENERAL NOTES**

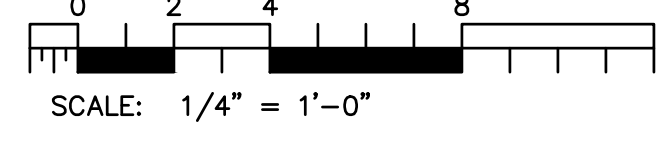
1. DEMOLISH ELECTRICAL SERVING GWH1, RCP1 & RCP2 BACK TO SOURCE OR NEAREST DEVICE TO REMAIN.

**DEMOLITION KEY NOTES**

- ① MAINTAIN EXISTING DISCONNECT/STARTER TO SERVE REVISED LOADS.
- ② REMOVE COMBO STARTER AND TURN OVER TO OWNER.
- ③ PANEL SERVING WATER HEATER EQUIPMENT BEING REVISED UNDER THIS WORK.



BOILER ROOM POWER NEW WORK PLAN



**GENERAL NOTES**

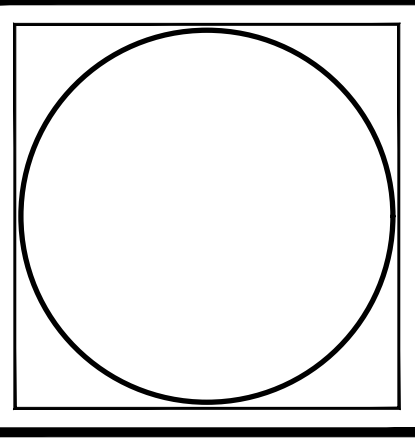
1. REPLACE LABELING ON ALL GEAR TO MATCH REVISED LOADS.
2. ALL ELECTRICAL GEAR IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.

**NEW WORK KEY NOTES**

- ① UPDATE PANEL DIRECTORY TO REFLECT ALL LOAD CHANGES.
- ② REUSE EXISTING COMBO STARTER TO SERVE PUMP. REVISE OL, FUSING TO MATCH HP RATING. REFER TO M-DWGS FOR REQUIRED CONTROL WIRING.
- ③ REUSE EXISTING DISCONNECT SWITCH TO SERVE WATER HEATER. REVISE FUSING TO MATCH LOAD.
- ④ PROVIDE DISCONNECT SWITCH TO SERVE WATER HEATER. REVISE FUSING TO MATCH LOAD.
- ⑤ REINSTALL LIGHTNING PROTECTION AIR TERMINALS AND CONDUCTORS TO MATCH EXISTING.

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**MUNICIPAL COURT BUILDING**  
**DWH REPLACEMENT**


DESIGNED BY  
JT

DRAWN BY  
MES

CHECKED BY  
JT

PROJECT NO.  
23104

DATE  
06/02/2023

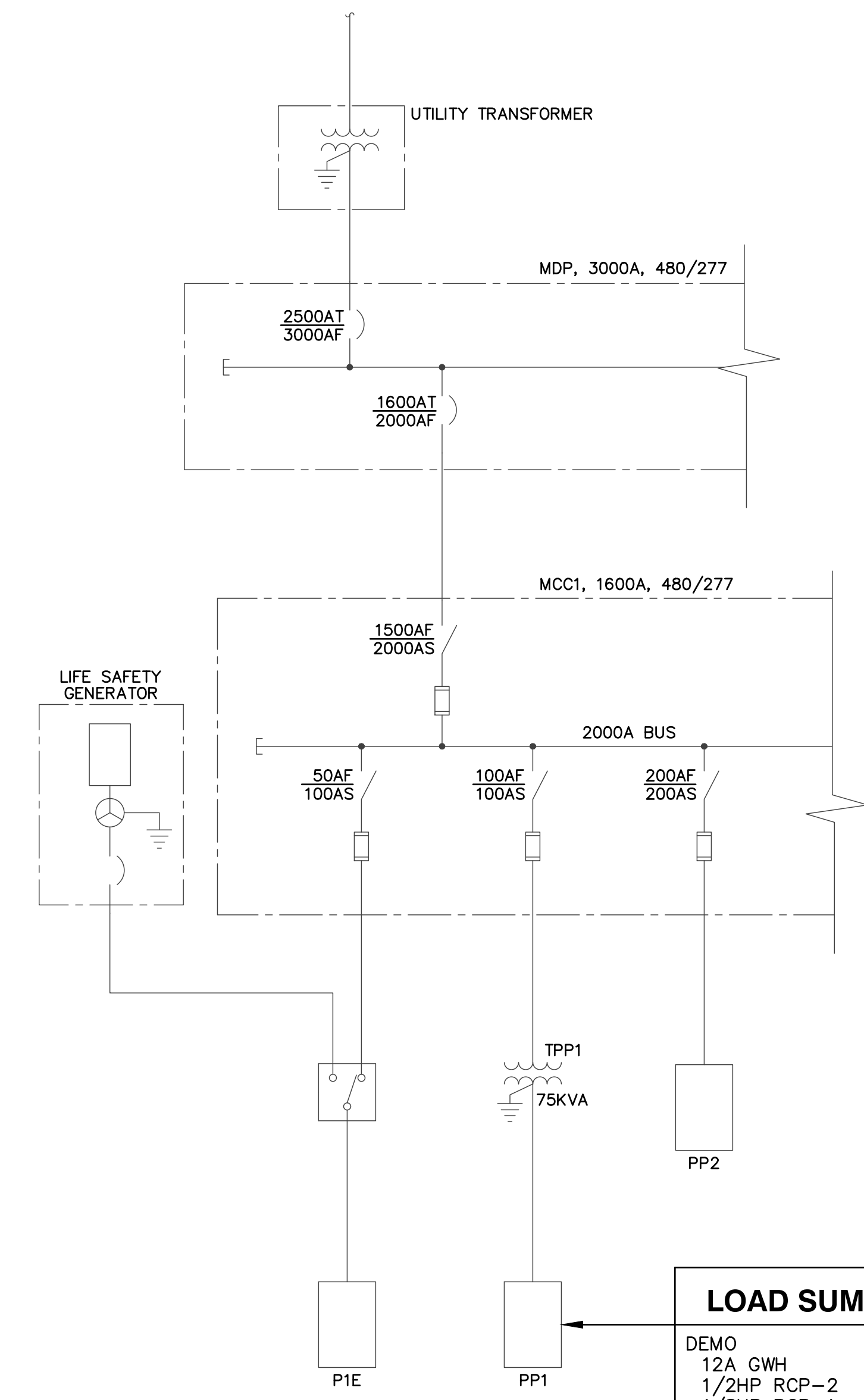
SHEET TITLE  
BOILER ROOM POWER PLANS

SHEET NO.  
E4.01

E4.01

**GENERAL ELECTRICAL REQUIREMENTS**

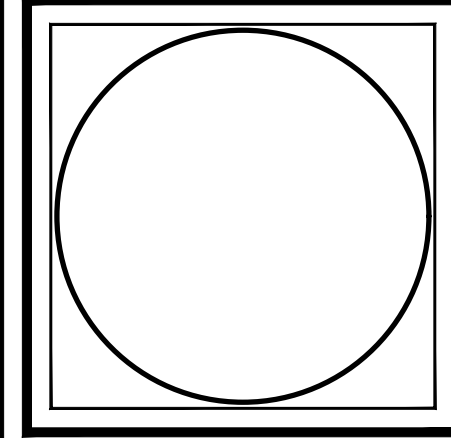
- PROVIDE ALL REQUIRED PERMITS, INSPECTIONS, AND COORDINATION WITH GOVERNING AUTHORITIES. THIS SHALL INCLUDE WALKING PROJECT THROUGH THE BUILDING DEPARTMENT. INSTALLATION SHALL COMPLY WITH ALL APPLICABLE CODES, TO INCLUDE:
    - 2021 INTERNATIONAL BUILDING CODE (IBC)
    - 2021 INTERNATIONAL MECHANICAL CODE (IMC)
    - 2021 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
    - NATIONAL FIRE PROTECTION AGENCY (NFPA)
    - 2023 NATIONAL ELECTRICAL CODE & NFPA 70 (NEC)
  - UNLESS OTHERWISE NOTED, THE WORK DESCRIBED ON THE PLANS SHALL INCLUDE ALL LABOR AND MATERIALS NECESSARY FOR COMPLETE AND OPERATIONAL ELECTRICAL SYSTEMS. PROVIDE ALL ITEMS REQUIRED FOR THE WORK WHETHER SPECIFICALLY SHOWN OR NOT. WORK SHALL BE PERFORMED BY QUALIFIED TRADESMEN AND INSTALLERS. CONTRACTOR IS RESPONSIBLE FOR REVIEWING ALL CONSTRUCTION DOCUMENTS AND COORDINATING ALL RELATED ELECTRICAL WORK WHETHER OR NOT SPECIFICALLY SHOWN ON ELECTRICAL DRAWINGS.
  - DATA GIVEN ON THE DRAWINGS IS AS ACCURATE AS COULD BE SECURED. ABSOLUTE ACCURACY IS NOT GUARANTEED; THE CONTRACTOR SHALL OBTAIN AND VERIFY EXACT LOCATIONS, MEASUREMENTS, SPACE REQUIREMENTS, POTENTIAL CONFLICTS WITH OTHER TRADES, ETC. AT THE SITE AND SHALL SATISFACTORILY ADAPT HIS WORK TO ACTUAL CONDITIONS AT THE PROJECT SITE. THE DRAWINGS ARE DIAGRAMMATIC IN NATURE AND SHALL NOT BE SCALED. THIS DOES NOT RELIEVE ANY SUB-CONTRACTOR FROM COORDINATING WORK WITH ALL OTHER TRADES AND FROM ADJUSTING HIS WORK AS REQUIRED BY THE ACTUAL CONDITIONS OF THE PROJECT. THE CONTRACTOR SHALL VISIT THE SITE BEFORE SUBMITTING A BID TO BECOME THOROUGHLY FAMILIAR WITH THE ACTUAL CONDITIONS OF THE PROJECT. NO CHANGE ORDERS WILL BE ALLOWED DUE TO LACK OF KNOWLEDGE OF EXISTING CONDITIONS.
  - ELECTRICAL CONTRACTOR SHALL PARTICIPATE IN THE CONTINUAL SURVEY OF THE EXISTING ELECTRICAL SYSTEMS TO TRACE AND IDENTIFY EXISTING CIRCUITS TO CONFIRM RECORD DRAWINGS. PRIOR TO THE START OF WORK, CONTRACTOR SHALL FIELD VERIFY ALL BRANCH CIRCUITS AND MAINTAIN ANY CIRCUIT THAT EXTENDS OUTSIDE THE LIMITS/SCOPE OF WORK.
  - WHERE ELECTRICAL SYSTEMS AND CIRCUITS PASS THROUGH LIMITS OF WORK AREA TO SERVE OTHER PORTIONS OF THE FACILITY, ELECTRICAL CONTRACTOR SHALL SUITABLY PROTECT TO PREVENT DAMAGE OR TEMPORARILY RELOCATE TO MAINTAIN NORMAL POWER.
  - VERIFY EQUIPMENT ELECTRICAL REQUIREMENTS PRIOR TO ROUGHING-IN OR PROVIDING FEEDERS AND CIRCUITS TO EQUIPMENT.
  - INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND NEC. COMPLETE MANUFACTURER'S START-UP REPORTS AND SUBMIT TO ENGINEER UPON COMPLETION.
  - GUARANTEE ALL MATERIALS, LABOR, WORKMANSHIP AND THE PROPER OPERATION OF ALL EQUIPMENT INSTALLED FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE. REPAIR OR REPLACE, AT NO EXPENSE TO THE OWNER, ALL DEFECTS WHICH MAY ARISE DURING THIS TIME DUE TO INFERIOR OR DEFECTIVE MATERIALS, EQUIPMENT OR WORKMANSHIP.
- DEFINITIONS:
    - (N) INDICATES "NEW" EQUIPMENT TO BE PROVIDED UNDER THIS CONTRACT.
    - (E) INDICATES "EXISTING" EQUIPMENT ON SITE WHICH MAY OR MAY NOT NEED TO BE RELOCATED AS A PART OF THIS WORK.
    - (D) INDICATES EXISTING EQUIPMENT SCHEDULED FOR "DEMOLITION".
    - "FURNISH" MEANS TO "SUPPLY" AND USUALLY REFERS TO AN ITEM OF EQUIPMENT.
    - "INSTALL" MEANS TO "SET IN PLACE, CONNECT AND PLACE INTO FULL OPERATIONAL ORDER".
    - "PROVIDE" MEANS TO "FURNISH AND INSTALL".
  - KEEP DEMOLITION & CUTTING TO MINIMUM REQUIRED FOR PROPER EXECUTION OF WORK. NO CUTTING (NOT SHOWN ON THE CONTRACT DOCUMENTS) SHALL BE DONE WITHOUT THE APPROVAL OF THE ENGINEER OR OWNER AS TO LOCATIONS, METHOD AND EXTENT OF THE CUTTING.
  - REPAIR ALL ACCIDENTAL OR INTENTIONAL DAMAGE TO MATCH EXISTING CONSTRUCTION WITH NO NOTICEABLE DIFFERENCE IN CONTINUITY, APPEARANCE, OR FUNCTION.
  - WHEN PRODUCTS ARE SPECIFIED BY MANUFACTURER AND MODEL NUMBER, EQUIVALENT PRODUCTS BY OTHER MANUFACTURERS LISTED MAY BE PROVIDED. PRODUCT EQUIVALENCY SHALL BE DETERMINED BY ENGINEER. CONTRACTOR IS RESPONSIBLE FOR COORDINATION AND DESIGN OF SUBSTITUTED EQUIPMENT; THIS SHALL INCLUDE DIFFERENT ELECTRICAL REQUIREMENTS, WEIGHT, PROPER FIT, AND ALL OTHER ASPECTS.
  - SUBMIT ELECTRONIC BOOKMARKED PDF'S (3) COPIES OF ELECTRICAL EQUIPMENT SUBMITTALS TO ARCHITECT/ENGINEER FOR REVIEW PRIOR TO ORDERING EQUIPMENT.
  - MAINTAIN A MARK-UP SET OF DRAWINGS WHICH INDICATES VARIATIONS IN THE ACTUAL INSTALLATION FROM THE ORIGINAL DESIGN. SUBMIT "AS-BUILT" DRAWINGS TO THE ARCHITECT/ENGINEER FOR REVIEW PRIOR TO FINAL PAY APPLICATION.
  - SUBMIT OPERATING MANUALS AND WARRANTIES IN TABBED 3-RING BINDERS TO ENGINEER FOR REVIEW. O&M MANUALS SHALL BE PREPARED IN FULL COMPLIANCE WITH THE 2009 IECC 503.2.9.3 "MANUALS". O&M MANUALS SHALL CONTAIN ALL TEAM CONTACTS, EMERGENCY CONTACTS, WARRANTY PROCEDURES, COMPREHENSIVE LIST OF EXTENDED WARRANTIES, APPROVED SUBMITTALS, AND MANUFACTURERS' OPERATING MANUALS.
  - PROVIDE ALL CUTTING, CHANNELING, CHASING, DRILLING, AND OTHER METHODS REQUIRED FOR THE ELECTRICAL WORK. PATCH, REPAIR, AND FINISH ALL WORK TO MATCH THE OVERALL FINISH REQUIREMENTS OF THE PROJECT.
  - ALL MATERIALS SHALL BE NEW; SHALL BE SUITABLE FOR THE PURPOSE; AND SHALL BE UL LISTED AS APPLICABLE. DAMAGED OR DEFECTIVE MATERIALS SHALL BE REPLACED.
  - FIRE STOPPING: PENETRATIONS THRU RATED WALLS AND FLOORS SHALL BE SEALED WITH MATERIALS CAPABLE OF PREVENTING THE PASSAGE OF FLAMES AND HOT GASSES WHEN SUBJECTED TO THE REQUIREMENTS OF THE TEST STANDARD SPECIFIC FOR FIRE STOPS ASTM-E-814. PROVIDE SHOP DRAWING SUBMITTALS FOR ALL APPLICATIONS AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION.



**ONE LINE DIAGRAM**  
NO SCALE

PANEL: PP1 (ex)		TYPE: LIGHTING		PROJECT NAME: MUNI COURT DWH REPLACEMENT													
FED FROM: MCC1		MOUNTING: SURFACE MOUNTED		PROJECT NO.: 23104													
VOLTAGE: 120/ 208		NEUTRAL BUS: Y		1. EXISTING G.E. A-SERIES PANEL LOCATED IN PENTHOUSE ELEC ROOM.													
PHASE: 3 PHASE, 4 WIRE		GROUND BUS: Y		EX CIRCUITS IMPACTED BY THIS WORK ARE PP1-10, 12 & 14. MAINTAIN EX-HWH CONTROL POWER.													
MAIN OC DEVICE: 225 AMPS		ISO GND: N		2. ORIGINAL EQUIPMENT DEMOD. CONNECT REPLACEMENT EQUIPMENT TO EX BREAKER UNO.													
MAIN LUGS: 225 AMPS				3. REPLACE ORIGINAL BREAKER WITH AMP/POLE BREAKER INDICATED.													
A.T.C. RATINGS: xx AMPS																	
				<b>OVERALL LOAD ADDED IS LESS THAN 5% OF PANEL RATING. //</b>													
DESCRIPTION	LTG (VA)	RECEP (VA)	MOTOR (VA)	OTHER (VA)	TOTAL (VA)	BRKR (VA)	CIRCUIT (VA)	PHASE	BRKR (VA)	TOTAL (VA)	OTHER (VA)	MOTOR (VA)	RECEP (VA)	LED (VA)	FLHD (VA)	DESCRIPTION	
EX RECEP	0	20	0	0	0	0	01 A 02	1	20	0	0	0	0	0	0	EX RECEP	
EX RECEP	0	20	0	0	0	0	03 B 04	1	20	0	0	0	0	0	0	EX GEN HTR	
EX RECEP	0	20	0	0	0	0	05 C 06	1	20	0	0	0	0	0	0	EX GEN HTR	
EX TEMP CONTROL	0	20	0	0	0	0	07 A 08	1	20	0	0	0	0	0	0	EX RD-1	
EX TEMP CONTROL	0	20	0	0	0	800	09 B 10	1	20	800	500	300	0	0	0	PUMP DWH-1 & CTL PNL (DEMO BP-1)	
SPARE	0	20	0	0	0	840	11 C 12	1	15	840	840	0	0	0	0	GW-H-1B WTR HTR (DEMO RCP-1)	
EX TEMP CONTROL	0	20	0	0	0	840	13 A 14	1	15	840	840	0	0	0	0	GW-H-1A WTR HTR (DEMO RCP-2)	
SPARE	0	20	0	0	0	0	15 B 16	1	15	0	0	0	0	0	0	EX CHLR-1A	
SPARE	0	20	0	0	0	0	17 C 18	1	15	0	0	0	0	0	0	EX CHLR-1B	
EX CH-1C, UH-1K, UTL	0	20	0	0	0	0	19 A 20	1	15	0	0	0	0	0	0	EX CHLR-2A	
EX UH-1P, 1R, 1S	0	20	0	0	0	0	21 B 22	1	15	0	0	0	0	0	0	EX CHLR-2B	
EX TEMP CONTROL	0	20	0	0	0	0	23 C 24	1	20	0	0	0	0	0	0	EX BATT CHARGER	
SPARE	0	20	0	0	0	0	25 A 26	1	20	0	0	0	0	0	0	SPARE	
SPARE	0	20	0	0	0	0	27 B 28	1	20	0	0	0	0	0	0	SPARE	
SPARE	0	20	0	0	0	0	29 C 30	1	20	0	0	0	0	0	0	EX SHUNT TRIP	
SPACE	0	-	0	0	0	0	31 A 32	1	20	0	0	0	0	0	0	EX CHLR-1C	
SPACE	0	-	0	0	0	0	33 B 34	1	20	0	0	0	0	0	0	SPARE	
SPACE	0	-	0	0	0	0	35 C 36	1	15	0	0	0	0	0	0	EX HWH-1A (CONTROL)	
SPACE	0	-	0	0	0	0	37 A 38	2	0	0	0	0	0	0	0	EX SHUNT TRIP	
SPACE	0	-	0	0	0	0	39 B 40	-	0	0	0	0	0	0	0	SPACE	
SPACE	0	-	0	0	0	0	41 C 42	-	0	0	0	0	0	0	0	SPACE	
<b>PANEL LOAD SUMMARY</b>																	
<b>CONNECTED LOAD AND PHASE SUMMARY</b>																	
LOAD TYPE	PH A	PH B	PH C	TOTAL	<b>DEMAND LOAD SUMMARY</b>												
LIGHTING LED	0.0	0.0	0.0	0.0 KVA	POWER FACTOR	CONNECTED LOAD (KW)	<b>DEMAND NEC CALCULATED</b>										
LIGHTING FL/HD	0.0	0.0	0.0	0.0 KVA	100%	0.0 KW	125%	0.0 KVA									
RECEPTACLES	0.0	0.0	0.0	0.0 KVA	95%	0.0 KW	125%	0.0 KVA									
MOTORS	0.0	0.3	0.0	0.3 KVA	95%	0.0 KW	100%	0.0 KVA									
OTHER	0.8	0.5	0.8	2.2 KVA	95%	0.0 KW	50%	0.0 KVA									
TOTAL	0.8	0.8	0.8	2.5 KVA	80%	0.2 KW	125%	0.4 KVA									
PHASE BALANCE	A-B	B-C	C-A	PNL PF =	80%	0.0 KW	100%	0.0 KVA									
	95%	95%	100%	0.93	95%	2.1 KW	125%	2.7 KVA									
MIN PANEL AMPACITY =	9 AMPS			TOTAL 2.3 KW 3.1 KVA													

**LOAD SUMMARY**  
 DEMO  
 12A GWH  
 1/2HP RCP-2  
 1/8HP RCP-1  
 ADD  
 7A GWH  
 7A GWH  
 1/4HP PUMP  
 LOAD ADDED IS LESS THAN 5% OF PANEL RATING.



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**MUNICIPAL COURT BUILDING  
DWH REPLACEMENT**

DESIGNED BY  
 JT

DRAWN BY  
 MES

CHECKED BY  
 LJB

PROJECT NO.  
 23104

DATE  
 06/02/2023

SCHEDULES & DIAGRAMS

NO. **E6.01**



**EXHIBIT 9 – BACKGROUND REQUEST FORM**

***Reference ONLY – DO NOT SUBMIT WITH PROPOSAL***

Starts on Next Page

## **GENERAL DIRECTIONS**

You have received this form because the duties/access of the position you are being considered for with the City of Colorado Springs requires additional security screening.

### **WHAT DO I DO NEXT?**

It is your responsibility to contact the Colorado Springs Police Department Records Section by phone at 719-444-7478 or 719-444-7521 or by email at [CSPDACCESS@ci.colospg.co.us](mailto:CSPDACCESS@ci.colospg.co.us) to schedule an appointment. It is best to make the appointment as soon as possible to avoid delaying the pre-employment process. If your position has been determined to require a polygraph exam, we will try to schedule fingerprints and the polygraph exam on the same day.

### **OK, I SCHEDULED MY APPOINTMENT, WHAT NEXT?**

All fingerprinting and polygraph exams are done at the:

Police Operations Center  
705 S Nevada Ave  
Colorado Springs, CO 80903

Parking can be limited at times so it is best give yourself a few extra minutes when arriving.

Bring your completed CJIS Background Request (CBR) form with you. Additionally, you will need a government issued photo identification as proof of your identity.

First, you will have a preliminary Query Based check completed. Your name and date of birth will be checked through various law enforcement databases. Please note certain items, such as felonies, may be automatic disqualifiers and you will not continue in the fingerprint process. In other instances, the Query results may require additional review before you are permitted to continue in the fingerprint process.

Once the Query is completed, you will then have your fingerprints taken by a technician and submitted to the Colorado Bureau of Investigation and the Federal Bureau of Investigation for review. Please review the attached document regarding use of your fingerprints. The results from these agencies will be sent to Colorado Springs Police Department with 72 hours. In some instances, it may take longer.

### **HOW DO I KNOW IF I PASSED?**

You will be notified by City Human Resources, or your sponsor in the case of a contractor/temporary staff, if the results impact your employment process either positively or negatively. PLEASE NOTE: City HR and general sponsors do not have access to the information obtained, and cannot answer questions if you receive negative results. You may appeal any negative results by contacting the same number you called to make your initial appointment. Your appeal will then be directed to the appropriate reviewer for consideration.





## AGENCY PRIVACY REQUIREMENTS FOR NONCRIMINAL JUSTICE APPLICANTS

Authorized governmental and non-governmental agencies/officials that conduct a national fingerprint-based criminal history record check on an applicant for a noncriminal justice purpose (such as employment or a license, immigration or naturalization matter, security clearance, or adoption) are obligated to ensure the applicant is provided certain notice and other information and that the results of the check are handled in a manner that protects the applicant's privacy. These obligations are pursuant to the Privacy Act of 1974, Title 5, United States Code (U.S.C.) Section 552a, and Title 28, Code of Federal Regulations (CFR), Section 50.12, among other authorities.

- Officials must provide to the applicant written notification<sup>1</sup> that his/her fingerprints will be used to check the criminal history records of the FBI.
- Officials must ensure that an applicant receives, and acknowledges receipt of, an adequate Privacy Act Statement when the applicant submits his/her fingerprints and associated personal information.<sup>2</sup>
- Officials using the FBI criminal history record (if one exists) to make a determination of the applicant's suitability for the employment, license, or other benefit must provide the applicant the opportunity to complete or challenge the accuracy of the information in the record.
- Officials must advise the applicant that procedures for obtaining a change, correction, or update of an FBI criminal history record are set forth at 28 CFR 16.34.
- Officials should not deny the employment, license, or other benefit based on information in the criminal history record until the applicant has been afforded a reasonable time to correct or complete the record or has declined to do so.
- Officials must use the criminal history record solely for the purpose requested and cannot disseminate the record outside the receiving department, related agency, or other authorized entity.<sup>3</sup>

The FBI has no objection to officials providing a copy of the applicant's FBI criminal history record to the applicant for review and possible challenge when the record was obtained based on positive fingerprint identification. If agency policy permits, this courtesy will save the applicant the time and additional FBI fee to obtain his/her record directly from the FBI by following the procedures found at 28 CFR 16.30 through 16.34. It will also allow the officials to make a more timely determination of the applicant's suitability.

Each agency should establish and document the process/procedures it utilizes for how/when it gives the applicant notice, what constitutes "a reasonable time" for the applicant to correct or complete the record, and any applicant appeal process that is afforded the applicant. Such documentation will assist State and/or FBI auditors during periodic compliance reviews on use of criminal history records for noncriminal justice purposes.

<sup>1</sup> Written notification includes electronic notification, but excludes oral notification.

<sup>2</sup> See <https://www.fbi.gov/services/cjis/compact-council/privacy-act-statement>

<sup>3</sup> See 5 U.S.C. 552a(b); 28 U.S.C. 534(b); 34 U.S.C. § 40316 (formerly cited as 42 U.S.C. § 14616), Article IV(c); 28 CFR 20.21(c), 20.33(d), 50.12(b) and 906.2(d).

# CJIS BACKGROUND REQUEST

COLORADO SPRINGS POLICE DEPARTMENT - RECORDS SECTION



This form is to be used to request that the CSPD Records Section conduct a Query based and Fingerprint based background check in accordance with Federal Bureau of Investigation's CJIS Security Manual.

DATE OF REQUEST  REASON FOR FINGERPRINTS

SEND DETERMINATION OF RESULTS TO:

NAME  DEPARTMENT  POSITION   
 PHONE  E-MAIL

- NOTE: FULL RESULTS CAN ONLY BE SHARED WITH THE CITY ATTORNEY'S OFFICE AND MUNICIPAL COURT -

## A. REQUIRED INFORMATION - PERSON TO BE FINGERPRINTED

LAST NAME  FIRST NAME  MIDDLE NAME

ALIASES (aka)

DATE OF BIRTH  PLACE OF BIRTH

RESIDENTIAL ADDRESS

US CITIZEN  SSN  SEX  HGT  WGT  EYES  HAIR

SUBJECT'S DEPARTMENT  SUBJECT'S PRIMARY CONTACT #

SUBJECT'S POSITION  SUBJECT'S PRIMARY EMAIL

SUBJECT IS A CONTRACTOR  
 (PLEASE ENTER COMPANY IN NOTES SECTION BELOW.)

NOTES

Print Form

## B. RECORDS - FACILITIES USE ONLY

DATE OF RECEIVED

APPT DATE

PRINTED BY  IBM

DATE SDDS RETURN RECEIVED

- E- COPY SENT TO CAO
- E- COPY SENT TO MUNI CT
- E- COPY SENT FOR REVIEW - CJIS COMP ONLY

REVIEWED BY

REVIEW DATE

- ACCEPTABLE
- NON- ACCEPTABLE

NOTES



## EXHIBIT 10 - SAMPLE BONDS

### CITY OF COLORADO SPRINGS PERFORMANCE BOND

1. KNOW BY ALL MEN BY THESE PRESENTS, THAT

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

As Principal, hereinafter called "Principal," and

\_\_\_\_\_  
(SURETY Name)

\_\_\_\_\_  
(SURETY Address)

A corporation organized and existing under the laws of the State of \_\_\_\_\_

And AUTHORIZED TO DO BUSINESS IN THE STATE OF COLORADO, as Surety, hereinafter called "Surety," are held firmly bound to the CITY OF COLORADO SPRINGS, COLORADO as Obligee, hereinafter called "Obligee," in the sum of ONE HUNDRED FORTY EIGHT THOUSAND EIGHT HUNDRED DOLLARS AND 00/100- (\$148,800.00 Dollars) lawful money of the United States of America

2. WHEREAS, the Principal and the Obligee have entered into a contract dated the 7<sup>th</sup> day of March, 2023 for the following project: Delta Concrete Channel Contract # R010497 TASK ORDER 2023-001, which contract is by reference made a part hereof, and referred to as "Contract."
3. NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT if the Principal shall promptly and faithfully perform all terms, conditions and other obligations of the Contract, and any modifications or extensions thereof granted by the Obligee, then this obligation shall be null and void: otherwise this obligation shall remain in full force and effect.
4. The Surety for value received agrees that no extension of time, change in, addition to, or other alteration or modification of the terms, conditions or obligations of the Contract or work to be performed thereunder, or any forbearance on the part of either the Obligee or the Principal to the other shall in any way release or affect the liability or obligation of this Bond, and the Surety hereby waives notice of any such extension of time, change, addition, modification, alteration or forbearance.



Page Two (2) of Performance Bond  
Signed and Sealed on the dates set forth below:

\_\_\_\_\_  
(Witness) FOR: \_\_\_\_\_  
(PRINCIPAL's Name)

BY: \_\_\_\_\_

ITS: \_\_\_\_\_

\_\_\_\_\_  
(Seal) This \_\_\_\_ Day of \_\_\_\_\_, 2023

\_\_\_\_\_  
(Witness) FOR: \_\_\_\_\_  
FOR: (SURETY'S Name)

BY: \_\_\_\_\_

ITS: \_\_\_\_\_

\_\_\_\_\_  
(Seal) This \_\_\_\_ Day of \_\_\_\_\_, 2023

Bond #: \_\_\_\_\_ This Bond  (is)  (is not) an SBA Guaranteed Bond.



**CITY OF COLORADO SPRINGS LABOR & MATERIAL PAYMENT BOND**

1. KNOW BY ALL MEN BY THESE PRESENTS, THAT

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

As Principal, hereinafter called "Principal," and

\_\_\_\_\_  
(SURETY Name)

\_\_\_\_\_  
(SURETY Address)

A corporation organized and existing under the laws of the State of \_\_\_\_\_

And AUTHORIZED TO DO BUSINESS IN THE STATE OF COLORADO, as Surety, hereinafter called "Surety," are held firmly bound to the CITY OF COLORADO SPRINGS, COLORADO as Obligee, hereinafter called "Obligee," in the sum of ONE HUNDRED FORTY EIGHT THOUSAND EIGHT HUNDRED DOLLARS AND 00/100- (\$148,800.00 Dollars) lawful money of the United States of America

2. WHEREAS, the Principal and the Obligee have entered into a contract dated the 7<sup>th</sup> day of March, 2023 for the following project: Delta Concrete Channel Contract # R010497 TASK ORDER 2023-001, which contract is by reference made a part hereof, and referred to as "Contract."
3. NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if the Principal shall promptly make payments of all amounts lawfully due to all persons supplying or furnishing the Principal or the Principals subcontractors with labor, materials, rental machinery, tools or equipment used or performed in the prosecution of the work provided for in the Contract; and if the Principal shall indemnify and save harmless the Obligee to the extent of any payments in connection with the carrying out of the Contract which the Obligee may be required to pay under the law, all in accord with Colorado State Law, Section 38-26-105 C.R.S., then this obligation shall be null and void; otherwise this obligation shall remain in full force and effect.

AND FURTHER, should the Principal or the Principal's subcontractors fail to duly pay for any labor, materials, team hire, sustenance, provisions, provender, or other supplies used or consumed by the Principal or the Principal's subcontractors in the performance of the work contracted to be done, or fails to pay any person who supplies rental machinery, tools or equipment, all amounts due as the result of the use of such machinery, tools, or equipment, in the prosecution of the work under the Contract, the Surety shall pay the same in an amount not exceeding the sum specified in this Bond together with interest at the rate of eight percent per annum, in accordance with Colorado State Law, Section 38-26-106 C.R.S.



In accordance with Colorado State Law, Section 38-26-105 C.R.S., actions against the Principal and Surety under this Bond shall be brought within six months after the final completion of the Contract as defined by the ordinances, rules and regulations of the City of Colorado Springs, Colorado, a home rule City, and not afterwards.

4. The Surety for value received agrees that no extension of time, change in, addition to, or other alteration or modification of the terms, conditions or obligations of the Contract or work to be performed thereunder, or any forbearance on the part of either the Obligee or the Principal to the other shall in any way release or affect the liability or obligation of this Bond, and the Surety hereby waives notice of any such extension of time, change, addition, modification, alteration or forbearance.



Page Two (2) of Labor and Material Payment Bond  
Signed and Sealed on the dates set forth below:

\_\_\_\_\_  
(Witness) FOR: \_\_\_\_\_  
(PRINCIPAL'S Name)

BY: \_\_\_\_\_

ITS: \_\_\_\_\_

\_\_\_\_\_  
(Seal) This \_\_\_\_ Day of \_\_\_\_\_, 2023

\_\_\_\_\_  
(Witness) FOR: \_\_\_\_\_  
FOR: (SURETY'S Name)

BY: \_\_\_\_\_

ITS: \_\_\_\_\_

\_\_\_\_\_  
(Seal) This \_\_\_\_ Day of \_\_\_\_\_, 2023

Bond #: \_\_\_\_\_ This Bond  (is)  (is not) an SBA Guaranteed Bond.



**CITY OF COLORADO SPRINGS MAINTENANCE BOND**

1. KNOW BY ALL MEN BY THESE PRESENTS, THAT

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

As Principal, hereinafter called "Principal," and

\_\_\_\_\_  
(SURETY Name)

\_\_\_\_\_  
(SURETY Address)

A corporation organized and existing under the laws of the State of \_\_\_\_\_

And AUTHORIZED TO DO BUSINESS IN THE STATE OF COLORADO, as Surety, hereinafter called "Surety," are held firmly bound to the CITY OF COLORADO SPRINGS, COLORADO as Obligee, hereinafter called "Obligee," in the sum of ONE HUNDRED FORTY EIGHT THOUSAND EIGHT HUNDRED DOLLARS AND 00/100- (\$148,800.00 Dollars) lawful money of the United States of America

2. WHEREAS, the Principal and the Obligee have entered into a contract dated the 7<sup>th</sup> day of March, 2023 for the following project: Delta Concrete Channel Contract # R010497 TASK ORDER 2023-001, which contract is by reference made a part hereof, and referred to as "Contract."
3. NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if the Principal shall promptly, properly and without cost to Obligee perform all maintenance and other guarantee obligations under the terms of the Contract, including any modifications or extensions thereof granted by the Obligee, for a period of TWO (2) year(s) from the date of final payment upon the Contract by the Obligee, and in the case of each correction or repair, during a period of ONE (1) year after the date of said correction or repair or for the remaining period of years set forth herein, whichever is longer, then this obligation shall be null and void; otherwise this obligation shall remain in full force and effect.
4. The Surety for value received agrees that no extension of time, change in, addition to, or other alteration or modification of the terms, conditions or obligations of the Contract or work to be performed thereunder, or any forbearance on the part of either the Obligee or the Principal to the other shall in any way release or affect the liability or obligation of this Bond, and the Surety hereby waives notice of any such extension of time, change, addition, modification, alteration or forbearance.





Page Two (2) of Maintenance Bond  
Signed and Sealed on the dates set forth below:

\_\_\_\_\_  
(Witness) FOR: \_\_\_\_\_  
(PRINCIPAL'S Name)

BY: \_\_\_\_\_

ITS: \_\_\_\_\_

\_\_\_\_\_  
(Seal) This \_\_\_\_ Day of \_\_\_\_\_, 2023

\_\_\_\_\_  
(Witness) FOR: \_\_\_\_\_  
FOR: (SURETY'S Name)

BY: \_\_\_\_\_

ITS: \_\_\_\_\_

\_\_\_\_\_  
(Seal) This \_\_\_\_ Day of \_\_\_\_\_, 2023

Bond #: \_\_\_\_\_ This Bond  (is)  (is not) an SBA Guaranteed Bond.



**ORIGINAL COPY**

**POWER OF ATTORNEY ON ALL BONDS**



## EXHIBIT 11 – NOTIFICATION OF UTILITIES

### General Information

It is the responsibility of the Contractor to notify all applicable utilities (including, but not limited to Colorado Springs Utilities) for utility locations at least two business days or twenty-four hours prior to commencing any work. Should any street be closed off for any amount of time, the Contractor must notify the Traffic Department. See the City of Colorado Springs Standard Specifications General Provisions for more information regarding utilities.

The City of Colorado Springs Standard Specifications and General Provisions indicated on the RFP for this project are included by reference. The above document may be reviewed or purchased at the City Administration Building, Engineering Division, at 30 South Nevada, Suite 403, Colorado Springs, Colorado, between the hours of 8:00 A.M. and 5:00 P.M., Monday through Friday, except holidays.

### Telephone References

- |   |                |
|---|----------------|
| 1. Utility Notification Center of Colorado      | 1-800-922-1987 |
| 2. Colorado Springs Utilities Electric          | (719) 448-4811 |
| 3. Colorado Springs Utilities Water, Wastewater | (719) 448-4200 |
| 4. Traffic Department                           | (719) 385-5908 |
| 5. Colorado Springs Utilities Gas Emergencies   | (719) 520-0100 |
| 6. Cable Television                             | (719) 633-6616 |
| 7. Telephone                                    | 1-800-954-0211 |

### Standard Utility Color Code

- |                |   |        |
|----------------|---|--------|
| 1. Natural Gas | - | Yellow |
| 2. Electric    | - | Red    |
| 3. Water       | - | Blue   |
| 4. Wastewater  | - | Green  |

### Contractor Responsibilities

1. Contact Colorado Springs Utilities, and/or other applicable utilities company or provider, at least twenty four hours prior to starting the project so that our service inspector can make contact on the job site.
2. All replacement taps will have to be coordinated and notification must be given to Colorado Springs Utilities twenty four hours prior to scheduling.
3. Any water interruption to properties involved must be notified at least twenty-four hours prior to shut down and coordinated with a service inspector.
4. If in the event a property or business is involved that cannot be without water the Contractor will be responsible for keeping them in water while the shut down is in effect.
5. If for any reason when water is restored after the shut down that a property has no water and Colorado Springs Utilities is contacted to determine the problem, the Contractor will be responsible for digging, regardless of the time of day to restore service. Contractor must



provide Colorado Springs Utilities with a name and telephone number of an after hours contact in case of emergency.

6. All services which would be replaced will have to meet our water specifications and be approved by the Water service inspector.
7. All materials pertaining to lowering or replacing water service lines, regardless of size, will be the responsibility of the Contractor unless otherwise specified in Engineering Specifications and Plans.
8. If for any reason it would not be feasible to shut down and notify affected properties, it would be the responsibility of the Contractor to provide temporary water for the houses or businesses involved.

#### Pre-excavation Checklist

1. Indicate all gas and other utility lines a set of construction plans.
2. Notify City of Colorado Springs Underground Utility Line Locators at least two business days in advance at the division numbers listed above.
3. Utilities locations should be marked on the ground by City Locators.
4. All employees should be briefed on the marking and the standard utility color codes.
5. Employees should be trained on excavation and safety procedures for natural gas lines.
6. When excavation approaches gas lines, employees should expose lines by careful hand digging and probing.
7. Contact the City Forester for any tree protection requirements that may be included on contract specifications



## **SCHEDULES**

Schedule A	Price Sheet
Schedule B	General Construction Terms and Conditions
Schedule C	Project Specifications
Schedule D	Minimum Insurance Requirements



## **SCHEDULE A – PRICE SHEET**

**Please Upload Pricing directly into Bidnet ([www.bidnetdirect.com](http://www.bidnetdirect.com))**



## **SCHEDULE B – GENERAL CONSTRUCTION TERMS AND CONDITIONS**

Schedule B -- General Construction Terms and Conditions, Version 100316 are hereby incorporated by reference, with the same force and effect as if they were given in full text. Upon request, the City will make their full text available. Also, the full text of a clause may be accessed electronically at this address:

<https://www.coloradosprings.gov/finance/page/procurement-regulations-and-documents>

The referenced General Construction Terms and Conditions will be incorporated in the resultant Contract



## **SCHEDULE C – PROJECT SPECIFICATIONS**

Starts on Next Page



# **PROJECT MANUAL**

## **City of Colorado Springs Municipal Court Building COLORADO SPRINGS, COLORADO**

### **DHW Replacement**

**100% CONSTRUCTION DOCUMENTS  
June 2nd, 2023**

**Prepared By:  
SCHENDT ENGINEERING CORP.**  
5145 Centennial Boulevard, Suite 200  
Colorado Springs, CO 80907-9207  
(719) 637-8850 Voice  
E-Mail: [sec@secengr.com](mailto:sec@secengr.com)

## TABLE OF CONTENTS

### Division 1 - General Requirements

<u>Section No.</u>	<u>Section Title</u>
01 10 00	Summary
01 31 00	Project Management and Coordination
01 33 00	Submittal Procedures
01 40 00	Quality Requirements
01 42 00	References
01 60 00	Product Requirements
01 73 10	Cutting and Patching
01 73 20	Selective Demolition
01 77 00	Closeout Procedures
01 82 00	Demonstration and Training
01 91 00	Commissioning Requirements

### Division 9 - Finishes

<u>Section No.</u>	<u>Section Title</u>
09 91 23	Painting

### Division 22 - Plumbing

<u>Section No.</u>	<u>Section Title</u>
22 00 00	Plumbing General Provisions
22 01 00	Plumbing Submittals
22 05 00	Basic Plumbing Materials and Methods
22 05 19	Meters and Gages for Plumbing
22 05 23	General Duty Valves for Plumbing
22 07 00	Plumbing Insulation
22 11 16	Domestic Water Piping
22 14 29	Plumbing Pumps
22 33 00	Plumbing Equipment

### Division 23 - Mechanical

<u>Section No.</u>	<u>Section Title</u>
23 00 00	Mechanical General Provisions
23 01 00	Mechanical Submittals
23 05 00	Basic Mechanical Materials and Methods
23 05 29	Hangers and Supports
23 08 00	Mech Cx Rqmts
23 09 00	Electric Control System
23 11 23	Fuel Gas Piping
23 51 00	Breachings Chimneys and Stacks

### Division 26 - Electrical

<u>Section No.</u>	<u>Section Title</u>
26 00 10	General Electrical
26 05 19	Low Voltage Power Conductors and Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
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26 05 53	Identification for Electrical Systems
26 08 05	Field Test and Operational Check for Electrical Systems
26 28 16	Enclosed Switches
26 41 13	Lightning Protection for Structures

**SECTION 01 10 00 - SUMMARY**

**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 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Project consists of removal and replacement of existing boilers.
  - 1. Project Location: City of Colorado Municipal Court
  - 2. Owner: City of Colorado
- B. The Work consists of the following:
  - 1. The demolition of existing water heater and the installation of new water heater.

1.3 CONTRACT

- A. Project will be constructed under a general construction contract. However, the owner reserves the right to self perform or separately contract some of the work.

1.4 WORK SEQUENCE

- A. The Work shall be conducted in single phase.

1.5 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Owner Occupancy: Allow for Owner occupancy of Project site.
  - 2. Driveways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
  - 3. Limit construction operations to those methods and procedures which will not adversely and unduly affect the working environment of the Owner's occupied spaces, including

noise, dust, odors, air pollution, ambient discomfort, poor lighting, hazards and other undesirable effects and conditions.

4. Disruptive operations: Noisy and disruptive operations (such as use of jack hammers and other noisy equipment) shall not be allowed at times that will disrupt the Owner's existing operations.
  - a. Schedule and coordinate such operations with Owner.
  - b. Upon notification from Owner, cease operations which are, in the opinion of the Owner, disruptive to operations. Schedule such operations as described above.
5. Power Outages: Do not interrupt power, lighting, plumbing, telephone and HVAC services to occupied areas. Coordinate and schedule any required utility outages with the Owner at least 30 days in advance of the outage; have Owner's approval.
6. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

#### 1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
  1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
  1. Architect will prepare a Notice of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
  2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
  3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
  4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building

#### 1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC's "MasterFormat" numbering system.
  1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the

beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 10 00**

## **SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION**

### **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 provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Conservation.
  - 3. Coordination Drawings.
  - 4. Administrative and supervisory personnel.
  - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

#### **1.3 COORDINATION**

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Pre-installation conferences.
  7. Start-up and adjustment of systems.
  8. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

#### 1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.
  2. Indicate required installation sequences.
  3. Refer to Division 23 Section "Basic Mechanical Materials and Methods" and Division 26 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: Within 10 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

#### 1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
- B. Pre-construction Conference: Schedule a pre-construction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing.
    - d. Designation of responsible personnel.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for processing Applications for Payment.
    - g. Distribution of the Contract Documents.
    - h. Submittal procedures.
    - i. Preparation of Record Documents.
    - j. Use of the premises.
    - k. Responsibility for temporary facilities and controls.
    - l. Parking availability.
    - m. Office, work, and storage areas.
    - n. Equipment deliveries and priorities.
    - o. First aid.
    - p. Security.
    - q. Progress cleaning.
    - r. Working hours.
- C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related Change Orders.



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- d. Purchases.
  - e. Deliveries.
  - f. Submittals.
  - g. Possible conflicts.
  - h. Compatibility problems.
  - i. Time schedules.
  - j. Weather limitations.
  - k. Manufacturer's written recommendations.
  - l. Warranty requirements.
  - m. Compatibility of materials.
  - n. Acceptability of substrates.
  - o. Temporary facilities and controls.
  - p. Space and access limitations.
  - q. Regulations of authorities having jurisdiction.
  - r. Testing and inspecting requirements.
  - s. Required performance results.
  - t. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements.
  4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Change Orders.

- 14) Documentation of information for payment requests.
3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Change Orders.
  3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

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**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 31 00**

## **SECTION 01 33 00 - SUBMITTAL PROCEDURES**

### **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 submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
  - 1. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
  - 2. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
  - 3. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.

#### 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

#### 1.4 SUBMITTAL PROCEDURES

- A. General: At Contractor's written request, copies of Architect's CAD files may be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
  - 1. Limited to drawings that already exist.
  - 2. Used by Contractor as background information only.
  - 3. Contractor includes a statement absolving the Architect or Engineer of all liability in connection with the use of said CAD drawing. This statement shall be included on all published drawings that include elements from the copied CAD files.
  - 4. Architect or Engineer will not be held responsible for delays in Contractor's submittals as a result of delivery or non-delivery of any CAD file.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

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2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
  3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 15 days for initial review of each submittal.
  3. If intermediate submittal is necessary, process it in same manner as initial submittal.
  4. Allow 10 days for processing each resubmittal.
  5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Unique identifier, including revision number.
    - i. Number and title of appropriate Specification Section.
    - j. Drawing number and detail references, as appropriate.
    - k. Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
  2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
  2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
  3. Transmittal Form: Provide locations on form for the following information:
    - a. Project name.
    - b. Date.
    - c. Destination (To:).
    - d. Source (From:).
    - e. Names of subcontractor, manufacturer, and supplier.
    - f. Category and type of submittal.
    - g. Submittal purpose and description.
    - h. Submittal and transmittal distribution record.
    - i. Remarks.
    - j. Signature of transmitter.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

## **PART 2 - PRODUCTS**

### **2.1 ACTION SUBMITTALS**

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Number of Copies: Submit four copies of each submittal, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.

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- e. Manufacturer's catalog cuts.
  - f. Wiring diagrams showing factory-installed wiring.
  - g. Printed performance curves.
  - h. Operational range diagrams.
  - i. Mill reports.
  - j. Standard product operating and maintenance manuals.
  - k. Compliance with recognized trade association standards.
  - l. Compliance with recognized testing agency standards.
  - m. Application of testing agency labels and seals.
  - n. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
- 1. Preparation: Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - l. Notation of dimensions established by field measurement.
  - 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  - 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
  - 4. Number of Copies: Submit four blue- or black-line prints of each submittal, unless prints are required for operation and maintenance manuals. Architect will retain two prints; remainder will be returned. Mark up and retain one returned print as a Project Record Drawing.
- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."
- E. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
- 1. Type of product. Include unique identifier for each product.
  - 2. Number and name of room or space.
  - 3. Location within room or space.
- F. Delegated-Design Submittal: Comply with requirements in Division 1 Section "Quality Requirements."
- G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

## 2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
  2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."
- B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- I. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.



- K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
  2. Date of evaluation.
  3. Time period when report is in effect.
  4. Product and manufacturers' names.
  5. Description of product.
  6. Test procedures and results.
  7. Limitations of use.
- N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."
- O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
  2. Required substrate tolerances.
  3. Sequence of installation or erection.
  4. Required installation tolerances.
  5. Required adjustments.
  6. Recommendations for cleaning and protection.
- Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.

6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- S. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

### **PART 3 - EXECUTION**

#### **3.1 CONTRACTOR'S REVIEW**

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### **3.2 ARCHITECT'S ACTION**

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. No Exceptions Taken.
  2. Rejected.
  3. Submit Specified Item.
  4. Make Corrections Noted.
  5. Revise & Resubmit.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

### **END OF SECTION 01 33 00**

## **SECTION 01 40 00 - QUALITY REQUIREMENTS**

### **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 quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-control services required by Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  - 1. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
  - 2. Divisions 2 through 33 Sections for specific test and inspection requirements.

#### **1.3 DEFINITIONS**

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Construction Manager.
- C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

#### **1.4 DELEGATED DESIGN**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

#### 1.5 CODE AND REGULATORY REQUIREMENTS

- A. Copies of Regulations: Obtain copies of the following codes and regulations and retain at Project site to be available for reference by parties who have a reasonable need:
  - 1. International Building Code (IBC) – 2015 Edition.
  - 2. International Mechanical Code (IMC) – 2015 Edition.
  - 3. International Plumbing Code (IPC) – 2018 Edition.
  - 4. International Fuel Gas Code (IFGC) – 2018 Edition.
  - 5. International Energy Conservation Code (IECC) – 2015 Edition.
  - 6. International Fire Code (IFC) – 2015 Edition.
  - 7. National Electrical Code (NEC) – 2020 Edition.

#### 1.6 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards.
  - 4. Identification of test and inspection methods.
  - 5. Number of tests and inspections required.
  - 6. Time schedule or time span for tests and inspections.
  - 7. Entity responsible for performing tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.
- D. Reports: Prepare and submit certified written reports that include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.

7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Ambient conditions at time of sample taking and testing and inspecting.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and re-inspecting.
- E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

#### 1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
- H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
1. Contractor responsibilities include the following:

- a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
  - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
  - c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
  - d. When testing is complete, remove assemblies; do not reuse materials on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

## 1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
  2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
  3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
  2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
1. Testing agency will notify Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Construction Manager, with copy to Contractor and to authorities having jurisdiction.

3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  5. Testing agency will retest and re-inspect corrected work.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
  5. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field-curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
  2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION 01 40 00**



## SECTION 01 42 00 - REFERENCES

### 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 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Architect": Architect or Engineer in responsible charge of the project.
- D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- E. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- F. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- G. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- H. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- I. "Provide": Furnish and install, complete and ready for the intended use.
- J. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- K. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with

special requirements indicated; and having complied with requirements of authorities having jurisdiction.

- L. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

### 1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
  - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
- E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

### 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

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AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AAN	American Association of Nurserymen (See ANLA)	
AASHTO	American Association of State Highway and Transportation Officials www.aashto.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute/ACI International www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AFPA	American Forest & Paper Association (See AF&PA)	
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association www.hardboard.org	(847) 934-8800
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The)	(800) 242-3837

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	www.aia.org	(202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANLA	American Nursery & Landscape Association (Formerly: AAN - American Association of Nurserymen) www.anla.org	(202) 789-2900
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts www.aosaseed.com	(505) 522-1437
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(941) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ASCA	Architectural Spray Coaters Association www.ascassoc.com	(609) 848-6120
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722
ASSE	American Society of Sanitary Engineering	(440) 835-3040

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	<a href="http://www.asse-plumbing.org">www.asse-plumbing.org</a>	
ASTM	ASTM International (American Society for Testing and Materials International) <a href="http://www.astm.org">www.astm.org</a>	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) <a href="http://www.awci.org">www.awci.org</a>	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (See WCMA)	
AWI	Architectural Woodwork Institute <a href="http://www.awinet.org">www.awinet.org</a>	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association <a href="http://www.awpa.com">www.awpa.com</a>	(817) 326-6300
AWS	American Welding Society <a href="http://www.aws.org">www.aws.org</a>	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association <a href="http://www.awwa.org">www.awwa.org</a>	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association <a href="http://www.buildershardware.com">www.buildershardware.com</a>	(212) 297-2122
BIA	Brick Industry Association (The) <a href="http://www.bia.org">www.bia.org</a>	(703) 620-0010
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) <a href="http://www.bifma.com">www.bifma.com</a>	(616) 285-3963
CCC	Carpet Cushion Council <a href="http://www.carpetcushion.org">www.carpetcushion.org</a>	(203) 637-1312
CCFSS	Center for Cold-Formed Steel Structures <a href="http://www.umn.edu/~ccfss">www.umn.edu/~ccfss</a>	(573) 341-4471
CDA	Copper Development Association Inc. <a href="http://www.copper.org">www.copper.org</a>	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association <a href="http://www.canelect.ca">www.canelect.ca</a>	(613) 230-9263
CFFA	Chemical Fabrics & Film Association, Inc. <a href="http://www.chemicalfabricsandfilm.com">www.chemicalfabricsandfilm.com</a>	(216) 241-7333
CGA	Compressed Gas Association <a href="http://www.cganet.com">www.cganet.com</a>	(703) 788-2700
CGSB	Canadian General Standards Board <a href="http://www.pwgsc.gc.ca/cgsb">www.pwgsc.gc.ca/cgsb</a>	(819) 956-0425

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CIMA	Cellulose Insulation Manufacturers Association <a href="http://www.cellulose.org">www.cellulose.org</a>	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association <a href="http://www.cisca.org">www.cisca.org</a>	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute <a href="http://www.cispi.org">www.cispi.org</a>	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute <a href="http://www.chainlinkinfo.org">www.chainlinkinfo.org</a>	(301) 596-2583
CPPA	Corrugated Polyethylene Pipe Association <a href="http://www.cppa-info.org">www.cppa-info.org</a>	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) <a href="http://www.carpet-rug.com">www.carpet-rug.com</a>	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute <a href="http://www.crsi.org">www.crsi.org</a>	(847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) <a href="http://www.csa-international.org">www.csa-international.org</a>	(800) 463-6727 (416) 747-4000
CSI	Construction Specifications Institute (The) <a href="http://www.csinet.org">www.csinet.org</a>	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau <a href="http://www.cedarbureau.org">www.cedarbureau.org</a>	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) <a href="http://www.cti.org">www.cti.org</a>	(281) 583-4087
DHI	Door and Hardware Institute <a href="http://www.dhi.org">www.dhi.org</a>	(703) 222-2010
EIA	Electronic Industries Alliance <a href="http://www.eia.org">www.eia.org</a>	(703) 907-7500
EIMA	EIFS Industry Members Association <a href="http://www.eifsfacts.com">www.eifsfacts.com</a>	(800) 294-3462 (770) 968-7945
EJMA	Expansion Joint Manufacturers Association, Inc. <a href="http://www.ejma.org">www.ejma.org</a>	(914) 332-0040
FCI	Fluid Controls Institute <a href="http://www.fluidcontrolsinstitute.org">www.fluidcontrolsinstitute.org</a>	(216) 241-7333
FGMA	Flat Glass Marketing Association (See GANA)	
FM	Factory Mutual System (See FMG)	

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FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
FSC	Forest Stewardship Council www.fscoax.org	52 951 5146905
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America (Formerly: FGMA - Flat Glass Marketing Association) www.glasswebsite.com/gana	(785) 271-0208
GRI	Geosynthetic Research Institute www.drexel.edu/gri	(215) 895-2343
GTA	Glass Tempering Division of Glass Association of North America (See GANA)	
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (See CSA)	
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council	(315) 646-2234

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	<a href="http://www.igcc.org">www.igcc.org</a>	
IGMA	Insulating Glass Manufacturers Alliance (The) <a href="http://www.igmaonline.org">www.igmaonline.org</a>	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. <a href="http://www.iliai.com">www.iliai.com</a>	(812) 275-4426
ISSFA	International Solid Surface Fabricators Association	(702) 567-8150
I3A	International Imaging Industry Association (Formerly: PIMA - Photographic & Imaging Manufacturers Association) <a href="http://www.pima.net">www.pima.net</a>	(914) 698-7603
ITS	Intertek Testing Services <a href="http://www.itsglobal.com">www.itsglobal.com</a>	(800) 345-3851 (607) 753-6711
IWS	Insect Screening Weavers Association (Now defunct)	
KCMA	Kitchen Cabinet Manufacturers Association <a href="http://www.kcma.org">www.kcma.org</a>	(703) 264-1690
LMA	Laminating Materials Association (Formerly: ALA - American Laminators Association) <a href="http://www.lma.org">www.lma.org</a>	(201) 664-2700
LPI	Lightning Protection Institute <a href="http://www.lightning.org">www.lightning.org</a>	(800) 488-6864 (847) 577-7200
LSGA	Laminated Safety Glass Association (See GANA)	
MBMA	Metal Building Manufacturers Association <a href="http://www.mbma.com">www.mbma.com</a>	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association <a href="http://www.maplefloor.org">www.maplefloor.org</a>	(847) 480-9138
MFMA	Metal Framing Manufacturers Association <a href="http://www.metalframingmfg.org">www.metalframingmfg.org</a>	(312) 644-6610
MHIA	Material Handling Industry of America <a href="http://www.mhia.org">www.mhia.org</a>	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America <a href="http://www.marble-institute.com">www.marble-institute.com</a>	(614) 228-6194
ML/SFA	Metal Lath/Steel Framing Association (See SSMA)	
MPI	Master Painters Institute <a href="http://www.paintinfo.com">www.paintinfo.com</a>	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and	(703) 281-6613



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	Fittings Industry Inc. www.mss-hq.com	
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NAAMM	North American Association of Mirror Manufacturers (See GANA)	
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281) 228-6200
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NAMI	National Accreditation and Management Institute, Inc.	(304) 258-5100
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(414) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(303) 697-8441
NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-6372
NGA	National Glass Association www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association	(800) 933-0318

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	www.natlhardwood.org	(901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association www.nofma.org	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSA	National Stone Association (See NSSGA)	
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association (Formerly: NSA - National Stone Association) www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo and Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (703) 779-1022
NWWDA	National Wood Window and Door Association (See WDMA)	
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322 (703) 359-0826
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (508) 230-3516
PGI	PVC Geomembrane Institute //pgi-tp.ce.uiuc.edu	(217) 333-3929
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400
RFCI	Resilient Floor Covering Institute www.rfci.com	Contact by mail only
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339 (415) 382-0662
SAE	SAE International www.sae.org	(724) 776-4841
SDI	Steel Deck Institute	(847) 462-1930

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	<a href="http://www.sdi.org">www.sdi.org</a>	
SDI	Steel Door Institute <a href="http://www.steeldoor.org">www.steeldoor.org</a>	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association <a href="http://www.sefalabfurn.com">www.sefalabfurn.com</a>	(516) 294-5424
SGCC	Safety Glazing Certification Council <a href="http://www.sgcc.org">www.sgcc.org</a>	(315) 646-2234
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)	
SJI	Steel Joist Institute <a href="http://www.steeljoist.org">www.steeljoist.org</a>	(843) 626-1995
SMA	Screen Manufacturers Association <a href="http://www.screenmfgassociation.org">www.screenmfgassociation.org</a>	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association <a href="http://www.smacna.org">www.smacna.org</a>	(703) 803-2980
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) <a href="http://www.sprayfoam.org">www.sprayfoam.org</a>	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) <a href="http://www.spib.org">www.spib.org</a>	(850) 434-2611
SPI/SPFD	Society of the Plastics Industry (The) Spray Polyurethane Foam Division (See SPFA)	
SPRI	SPRI (Single Ply Roofing Institute) <a href="http://www.spri.org">www.spri.org</a>	(781) 444-0242
SSINA	Specialty Steel Industry of North America <a href="http://www.ssina.com">www.ssina.com</a>	(800) 982-0355 (202) 342-8630
SSMA	Steel Stud Manufacturers Association (Formerly: ML/SFA - Metal Lath/Steel Framing Association) <a href="http://www.ssma.com">www.ssma.com</a>	(312) 456-5590
SSPC	SSPC: The Society for Protective Coatings <a href="http://www.sspc.org">www.sspc.org</a>	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute <a href="http://www.steeltank.com">www.steeltank.com</a>	(847) 438-8265
SWI	Steel Window Institute <a href="http://www.steelwindows.com">www.steelwindows.com</a>	(216) 241-7333

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SWRI	Sealant, Waterproofing, and Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TPI	Truss Plate Institute	(608) 833-5900
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 705-9898
UL	Underwriters Laboratories Inc. www.ul.com	(800) 704-4050 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USITT	United States Institute for Theatre Technology, Inc. www.culturenet.ca/usitt	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (See WCSC)	
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 661-4261
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WIC	Woodwork Institute of California www.wicnet.org	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

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Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA	BOCA International, Inc.  www.bocai.org	(708) 799-2300
CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials (The) www.iapmo.org	(909) 595-8449
ICBO	International Conference of Building Officials  www.icbo.org	(800) 284-4406 (562) 699-0541
ICC	International Code Council, Inc.  (Formerly: CABO - Council of American Building Officials) www.intlcode.org	(703) 931-4533
SBCCI	Southern Building Code Congress International, Inc.  www.sbcci.org	(205) 591-1853

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-0990
DOC	Department of Commerce www.doc.gov	(202) 482-2000
EPA	Environmental Protection Agency www.epa.gov	(202) 260-2090
FAA	Federal Aviation Administration www.faa.gov	(202) 366-4000
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(202) 708-5082
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley Laboratory	

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(See LBNL)

LBNL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-5605
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Building Service (See GSA)	
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
TRB	Transportation Research Board www.nas.edu/trb	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CAPUC (See CPUC)

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(800) 952-5210 (916) 574-2041
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(415) 703-2782
TFS	Texas Forest Service Forest Products Laboratory //txforests-service.tamu.edu	(936) 639-8180

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 42 00**

## **SECTION 01 60 00 - PRODUCT REQUIREMENTS**

### **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 the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
  - 1. Division 1 Section "References" for applicable industry standards for products specified.
  - 2. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
  - 3. Divisions 2 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

#### **1.3 DEFINITIONS**

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

#### 1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
  - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
  - 2. Form: Tabulate information for each product under the following column headings:
    - a. Specification Section number and title.
    - b. Generic name used in the Contract Documents.
    - c. Proprietary name, model number, and similar designations.
    - d. Manufacturer's name and address.
    - e. Supplier's name and address.
    - f. Installer's name and address.
    - g. Projected delivery date or time span of delivery period.
    - h. Identification of items that require early submittal approval for scheduled delivery date.
  - 3. Initial Submittal: Within 15 days after date of commencement of the Work, submit 4 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
    - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
  - 4. Completed List: Within 30 days after date of commencement of the Work, submit 4 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
  - 5. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.



- b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
  - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - f. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - g. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
  - h. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
  - i. Cost information, including a proposal of change, if any, in the Contract Sum.
  - j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
  - k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
    - a. Form of Acceptance: Change Order.
    - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
  1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
  - 5. Store products to allow for inspection and measurement of quantity or counting of units.
  - 6. Store materials in a manner that will not endanger Project structure.
  - 7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  - 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  - 9. Protect stored products from damage.
- B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
  - 3. Refer to Divisions 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

**PART 2 - PRODUCTS**

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
  7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
    - a. Substitutions may be considered, unless otherwise indicated.
  2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
    - a. Substitutions may be considered, unless otherwise indicated.
  3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
    - a. Substitutions may be considered, unless otherwise indicated.
  4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
    - a. Substitutions may be considered, unless otherwise indicated.
  5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
  6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
  7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable

- product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
    - a. Substitutions will not be considered, unless otherwise indicated.
  9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
    - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
  10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
    - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
    - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 10 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  2. Requested substitution does not require extensive revisions to the Contract Documents.
  3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  4. Substitution request is fully documented and properly submitted.
  5. Requested substitution will not adversely affect Contractor's Construction Schedule.
  6. Requested substitution has received necessary approvals of authorities having jurisdiction.

7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

### 2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
  1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  3. Evidence that proposed product provides specified warranty.
  4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  5. Samples, if requested.

### **PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01 60 00**

## **SECTION 01 73 10 - CUTTING AND PATCHING**

### **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 procedural requirements for cutting and patching.
- B. Related Sections include the following:
  - 1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building for alterations.
  - 2. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.
  - 3. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
    - a. Requirements in this Section apply to fire suppression, plumbing, mechanical and electrical installations. Refer to Divisions 21, 22, 23 and 26 Sections for other requirements and limitations applicable to cutting and patching fire suppression, plumbing, mechanical and electrical installations.

#### **1.3 DEFINITIONS**

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### **1.4 SUBMITTALS**

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  - 3. Products: List products to be used and firms or entities that will perform the Work.
  - 4. Dates: Indicate when cutting and patching will be performed.

5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

#### 1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  1. Primary operational systems and equipment.
  2. Air or smoke barriers.
  3. Fire-protection systems.
  4. Control systems.
  5. Communication systems.
  6. Electrical wiring systems.
  7. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  1. Water, moisture, or vapor barriers.
  2. Membranes and flashings.
  3. Exterior curtain-wall construction.
  4. Equipment supports.
  5. Piping, ductwork, vessels, and equipment.
  6. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
  1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
    - a. Processed concrete finishes.
    - b. Stonework and stone masonry.
    - c. Preformed metal panels.
    - d. Roofing.
    - e. Firestopping.

- f. Wall covering.
  - g. HVAC enclosures, cabinets, or covers.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.



- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

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4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

**END OF SECTION 01 73 10**

## **SECTION 01 73 20 - SELECTIVE DEMOLITION**

### **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 the following:
  - 1. Demolition and removal of selected site elements.
  - 2. Repair procedures for selective demolition operations.
- B. Related Sections include the following:
  - 1. Division 1 Section "Summary" for use of the premises and phasing requirements.
  - 2. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
  - 3. Division 21 Sections for demolishing, cutting, patching, or relocating fire suppression items.
  - 4. Division 22 Sections for demolishing, cutting, patching, or relocating plumbing items.
  - 5. Division 23 Sections for demolishing, cutting, patching, or relocating mechanical items.
  - 6. Division 16 Sections for demolishing, cutting, patching, or relocating electrical items.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

#### 1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
  - 2. Interruption of utility services.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Locations of temporary partitions and means of egress.
  - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements."
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
  - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site will not be permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.
  - 1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage original Installer or fabricator, engage another recognized experienced and specialized firm.
    - a. Processed concrete finishes.
    - b. Stonework and stone masonry.
    - c. Preformed metal panels.
    - d. Roofing.
    - e. Firestopping.
    - f. Wall covering.
    - g. HVAC enclosures, cabinets, or covers.

## **PART 2 - PRODUCTS**

### 2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
  - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### 3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
  - 1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

### 3.3 PREPARATION

- A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
  2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
  3. Protect existing site improvements, appurtenances, and landscaping to remain.
  4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- C. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

### 3.4 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
  1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
  2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

### 3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
  - 5. Maintain adequate ventilation when using cutting torches.
  - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  - 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 9. Dispose of demolished items and materials promptly.
  - 10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
- B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Salvaged Items: Comply with the following:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area designated by Owner.
  - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items: Comply with the following:



1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- F. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- G. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- H. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- I. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- J. Roofing: Remove no more existing roofing than can be covered in one day by new roofing. Refer to applicable Division 7 Section for new roofing requirements.
- K. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

### 3.6 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching."
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of

uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
  3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Burning: Burning of demolished materials will be permitted only at designated areas on Owner's property, providing required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- D. Disposal: Transport demolished materials and dispose of at designated spoil areas on Owner's property.
- E. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

### 3.8 SELECTIVE DEMOLITION SCHEDULE

- A. The extent of selective demolition is generally defined on the drawings. The owner reserves the right to salvage any equipment, components or devices removed during demolition. Demolition shall include removal of the following miscellaneous items not shown to be removed that would otherwise be abandoned in place:
1. Conduit and piping that has been disconnected.
  2. Control wiring and devices that have been disconnected.
  3. Pneumatic tubing that has been disconnected including pneumatic devices and control panels.
    - a. Previously abandoned conduit, wiring, tubing, piping, and devices.

**END OF SECTION 01 73 20**

## **SECTION 01 77 00 - CLOSEOUT PROCEDURES**

### **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 contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Project Record Documents.
  - 3. Operation and maintenance manuals.
  - 4. Warranties.
  - 5. Instruction of Owner's personnel.
  - 6. Final cleaning.
- B. Related Sections include the following:
  - 1. Division 1 Section "Demonstration and Training" for requirements for instruction of Owner's personnel.
  - 2. Divisions 2 through 33 Sections for specific closeout and special cleaning requirements for products of those Sections.

#### **1.3 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, and similar final record information.
  - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 8. Complete startup testing of systems.
  - 9. Submit test/adjust/balance records.

10. Terminate and remove temporary facilities from Project site, along with construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

#### 1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Revise paragraph and subparagraph below to comply with office policy and Project requirements.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first [and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:
  - a. Project name.
  - b. Date.
  - c. Name of Architect.
  - d. Name of Contractor.
  - e. Page number.

#### 1.6 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
  1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
    - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
  2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
  3. Mark important additional information that was either shown schematically or omitted from original Drawings.
  4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
  5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Note related Change Orders, Record Drawings, and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

#### 1.7 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
    - a. Emergency instructions and procedures.
    - b. System, subsystem, and equipment descriptions, including operating standards.
    - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
    - d. Description of controls and sequence of operations.
    - e. Piping diagrams.
  2. Maintenance Data:
    - a. Manufacturer's information, including list of spare parts.
    - b. Name, address, and telephone number of Installer or supplier.
    - c. Maintenance procedures.
    - d. Maintenance and service schedules for preventive and routine maintenance.
    - e. Maintenance record forms.
    - f. Sources of spare parts and maintenance materials.
    - g. Copies of maintenance service agreements.
    - h. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

#### 1.8 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

## **PART 2 - PRODUCTS**

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## **PART 3 - EXECUTION**

### 3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. Provide instructors experienced in operation and maintenance procedures.
  2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
  3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
  4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
1. System design and operational philosophy.
  2. Review of documentation.
  3. Operations.
  4. Adjustments.
  5. Troubleshooting.
  6. Maintenance.
  7. Repair.

### 3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - g. Sweep concrete floors broom clean in unoccupied spaces.
    - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - j. Remove labels that are not permanent.
    - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - m. Replace parts subject to unusual operating conditions.
    - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
    - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and



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defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

- r. Leave Project clean and ready for occupancy.
  
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

**END OF SECTION 01 77 00**

## **SECTION 01 82 00 - DEMONSTRATION AND TRAINING**

### **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 instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.

#### 1.3 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit two complete training manuals for Owner's use.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
- E. Demonstration and Training Videotape: Submit two copies at end of each training module.

#### 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

### **PART 2 - PRODUCTS**

#### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Heat generation, including pumps and mixing valves.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.

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- d. Project Record Documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.

- b. Repair instructions.
- c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
- d. Instructions for identifying parts and components.
- e. Review of spare partsd for operation and maintenance.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

#### **3.2 INSTRUCTION**

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
  - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written, or a demonstration performance-based test.
- E. Demonstration and Training Videotape: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

**END OF SECTION 01 82 00**

## **SECTION 01 91 00 – COMMISSIONING REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. The Owner has retained an independent third party commissioning provider to implement and coordinate the commissioning process for this project.
- B. Commissioning: Commissioning is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meet defined objectives and criteria. The Commissioning process begins at project inception (during the pre-design phase) and continues through the life of the facility. The commissioning process includes specific tasks to be conducted during each phase in order to verify that design, construction, and training meets the Owner's project requirements.
- C. Commissioning Team: The members of the commissioning team consist of the contracted commissioning agent (CxA) SEC, the Owner's representative/construction manager (CM), the general contractor (GC), the architect and design engineers, the mechanical contractor (MC), the electrical contractor (EC), the testing and balancing (TAB) contractor, the control contractor (CC), the facility operating staff, and any other installing subcontractors or suppliers of equipment. The contracted commissioning authority is hired by the Owner directly. The CxA directs and coordinates the project commissioning activities and the reports to the Owner. All team members work together to fulfill their contracted responsibilities and meet the objectives of the contract documents. Commissioning shall:
  - 1. Verify that applicable equipment and systems are installed according to the contract documents, manufacturer's recommendations, and industry accepted minimum standards and these receive adequate operational checkout by installing contractors.
  - 2. Verify and document proper performance of equipment and systems.
  - 3. Verify that O&M documentation left on site is complete.
  - 4. Verify that the Owner's operating personnel are adequately trained.
- D. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

#### **1.2 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.
- B. Owner's Project Requirements and Basis of Design documents are included by reference for information only.
- C. ASHRAE Guideline 0-2005

#### **1.3 SUMMARY**

- A. This section includes general requirements that apply to the implementation of the commissioning process without regard to specific systems, assemblies, and components.

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

- B. Related sections include the following:
  - 1. Division 1 Specifications.
  - 2. Drawings.
  - 3. Division 23 HVAC&R Systems for commissioning process activities for heating, ventilating, air-conditioning, and refrigerating systems, assemblies, equipment, and components.

#### 1.4 DEFINITIONS

- A. Acceptance - A formal action, taken by a person with appropriate provider (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.
- B. Approval - Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the contract documents.
- C. Basis of Design - A document that records the concepts, calculations, decisions, and product selections used to meet the Owner's project requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- D. Checklists - Verification checklists that are developed and used during all phases of the commissioning process to verify that the Owner's project requirements are being achieved. This includes checklists for general verification, plus testing, training, and other specific requirements.
- E. Commissioning Authority (CxA) - The entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process.
- F. Commissioning Plan - An overall plan developed by the commissioning agent that provides the structure, schedule and coordination planning for the commissioning process.
- G. Commissioning Process - A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's project requirements.
- H. Commissioning Process Activities - Components of the commissioning process.
- I. Commissioning Process Progress Report - A written document that details activities completed as part of the commissioning process and significant findings from those activities that is continuously updated during the course of a project. Usually it is incorporated into the commissioning plan as an ongoing appendix.
- J. Commissioning Team - The individuals who through coordinated actions are responsible for implementing the commissioning process.
- K. Construction Checklist - A form used by the contractor to verify that appropriate components are on-site, ready for installation, correctly installed, and functional. Also see Checklists.

- L. Construction Documents - This includes a wide range of documents, which will vary from project to project, with the Owner's needs and with regulations, laws, and countries. Construction documents usually include the project manual (specifications), plans (drawings) and general terms and conditions of the contract.
- M. Contract Documents - This includes a wide range of documents, which will vary from project to project, with the Owner's needs and with regulations, laws, and countries. Contract documents frequently include price agreements, construction management process, sub-contractor agreements or requirements, requirements and procedures for submittals, changes, and other construction requirements, timeline for completion, and the construction documents.
- N. Coordination Drawings - Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.
- O. Control system - A component of environmental, HVAC, security, and fire systems for reporting/monitoring and issuing of commands to/from field devices.
- P. Data Logging -The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the control system or the trending capabilities of control systems.
- Q. Deferred Performance Tests (DPTs) - Performance tests that are performed, at the discretion of the CxA, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that disallow the test from being performed.
- R. Deficiency - A condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the contract documents.
- S. Factory Testing - Testing of equipment on-site or at the factory, by factory personnel, with or without an Owner's representative present.
- T. Issues Log - A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the commissioning team during the course of the commissioning process.
- U. Non-Compliance - See Deficiency.
- V. Non-Conformance - See Deficiency.
- W. On-Going Commissioning Process - A continuation of the commissioning process well into the occupancy and operations phase to verify that a project continues to meet current and evolving Owner's project requirements. On-going commissioning process activities occur throughout the life of the facility. Some of these will be close to continuous in implementation, and others will be either scheduled or unscheduled (as needed).
- X. Owner's Project Requirements - A written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. (The term "Project Intent" is used by some Owners for their commissioning process Owner's project requirements or design.)
- Y. Over-ridden Value - Riding over a sensor value in the equipment's controls to observe the response of the equipment's operation. Also see Simulated Signal.



- Z. Phased Commissioning - Commissioning that is completed in phases as required by the phasing plan as approved for the project and other scheduling issues.
- AA. Quality Based Sampling - A process for evaluating a sub-set (sample) of the total population. The sample is based upon a known or estimated probability distribution of expected values; an assumed statistical distribution based upon data from a similar product, assembly, or system; or a random sampling that has scientific statistical basis.
- BB. Re-Commissioning - An application of the commissioning process requirements to a project that has been delivered using the commissioning process. This may be a scheduled re-commissioning developed as part of an ongoing commissioning process, or it may be triggered by use change, operations problems, or other needs.
- CC. Retro-Commissioning -The commissioning process applied to an existing facility that was not previously commissioned. This guideline does not specifically address retro-commissioning. However, the same basic process needs to be followed from pre-design through occupancy and operations to optimize the benefits of implementing the commissioning process philosophy and practice.
- DD. Seasonal Performance Tests - Performance tests that are deferred until the system(s) will experience conditions closer to their design conditions based on weather conditions.
- EE. Simulated Condition - Condition that is created for the purpose of testing the response of a system (e.g., raising/lowering the setpoint of a thermostat to see the response in a VAV box).
- FF. Simulated Signal - Disconnecting a sensor and using a signal generator to simulate a sensor value for the purpose of testing a full range of conditions.
- GG. Startup - The initial starting or activating of dynamic equipment, including completing construction checklists.
- HH. Systems Manual - A system-focused composite document that includes the operation manual, maintenance manual, and additional information of use to the Owner during the occupancy and operations phase. This document is required by LEED and will be assembled by the CxA. Much of the information will be extracted from the O&M's provided by the contractor, Basis of Design provided by the design team, BAS screen shots, etc.
- II. Test Procedure - A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems. The test procedures are specified in the Technical Specifications sections of the contract documents. Performance testing covers the dynamic functions and operations of equipment and systems using manual or monitoring methods. Performance testing is the dynamic testing of systems under full operation. Systems are tested under various modes, such as during low cooling loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to respond as the sequences state.
- JJ. Training Plan - A written document that details the expectations, schedule, budget, and deliverables of commissioning process activities related to training of project operating and maintenance personnel, users, and occupants.
- KK. Verification - The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.

- LL. Trending – The monitoring, by a building management system or other electronic data gathering equipment, and analyzing of the data gathered over a period of time.
- MM. Vendor - Supplier of equipment.
- NN. Warranty Period - Refer to Division 1 specifications.

#### 1.5 COORDINATION

- A. Project Commissioning Team - The members of the project commissioning team will consist of the commissioning authority and any support personnel, the construction manager, the Owner's facility staff (FS) or designee, the general contractor, subcontractors and/or vendors as required, and the architect/ engineer (A/E).
- B. Management - The CxA coordinates the commissioning activities through the construction manager. All members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents. Refer to Paragraph 1.6 for additional management details.
- C. Scheduling - The CxA, through the Owner or CM, will provide sufficient notice to the contractor for scheduling commissioning activities with respect to the Owner's participation. The contractor will integrate all commissioning activities into the overall project schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

#### 1.6 COMMISSIONING PLAN

- A. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.
  - 1. Commissioning during construction begins with an initial commissioning meeting conducted by the CxA where the commissioning process is reviewed with the project commissioning team members.
  - 2. Additional meetings will be required throughout construction scheduled by the CxA through the Owner or CM, with necessary parties attending to plan, scope, coordinate, schedule future activities and resolve problems.
  - 3. Equipment documentation is submitted to the CxA, through the Owner or CM, during normal submittals, including detailed startup procedures.
  - 4. The construction checklists are to be completed by the contractor (or its subcontractors), before and during the startup process.
  - 5. Construction checklists, TAB and startup must be completed before performance testing.
  - 6. Items of non-compliance in material, installation, or setup shall be corrected at no expense to the Owner.
  - 7. The contractor ensures that the subcontractors' construction checklists are executed and documented and that startup and initial checkout are performed. The CxA verifies that the TAB, construction checklists and startup were completed according to the approved plans. This includes the CxA approving TAB, checklists and startup plans. This also includes witnessing startup of selected equipment. Any testing failure is to be corrected at no additional cost to the Owner, and a re-test is to be performed, observed, and documented.
  - 8. The CxA develops and implements equipment and system performance test procedures. The forms and procedures are approved by the Owner, CM and A/E.

9. The performance tests are executed by the contractor under the direction of the CxA with the assistance of the facility staff. All documentation is by the CxA.
10. The CxA reviews the O&M documentation for completion and provides the commissioning record for the O&M manuals.
11. Commissioning should be completed before substantial completion.
12. The CxA develops procedures, reviews, coordinates, and implements the training provided by the contractor.
13. Deferred testing is conducted as specified or required.

## 1.7 COMMISSIONING TEAM

- A. Members appointed by Owner:
  1. CxA - An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
  2. Representatives of the facility user and operation and maintenance personnel.
  3. Architect and engineering design professionals.
- B. Members appointed by contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each contractor, including project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA including but not limited to General Contractor (GC), the Mechanical Contractor (MC), the Electrical Subcontractor(s) (ES), the Testing Adjusting and Balancing (TAB) subcontractor, the Controls Subcontractor (CC), Fire Protection Contractor, etc.
- C. Members of the Commissioning Team, at minimum, to include:
  1. Owner's Representative
  2. Owner Operations Staff Representative
  3. Architect / Engineer (A/E)
  4. General Contractor
  5. Mechanical Subcontractor
  6. Fire Protection Subcontractor
  7. Major HVAC, Plumbing, and Fire Protection Equipment Suppliers
  8. Instrumentation and Controls Sub-contractor
  9. Instrumentation and Controls Supplier
  10. Test and Balance Sub-contractor
  11. Commissioning Authority

## 1.8 RESPONSIBILITIES

- A. The general responsibilities of various parties in the commissioning process are provided in this subsection. The specific responsibilities are in the Technical Specifications.
- B. All Cx Team (CxT) Members:
  1. Follow the commissioning plan.
  2. Attend initial commissioning meeting and additional meetings as necessary.
  3. Cooperate with all CxT members to carry out commissioning process.
  4. Include the price of commissioning responsibilities/tasks in each CxT member's proposal.

C. Commissioning Authority (CxA)

1. Develops a commissioning plan outlining the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. CxA oversees implementation of commissioning plan.
2. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
3. Coordinate the commissioning work and, with the GC and Owner/CM, help integrate commissioning activities into the master schedule.
4. Revise the Construction Phase Commissioning Plan as necessary.
5. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
6. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor startup and checkout procedures.
7. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
8. Review and recommend approval of normal contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
9. Write and distribute construction checklists. Prepare and maintain completed construction checklist log.
10. Develop an enhanced startup and initial systems checkout plan with subcontractors.
11. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
12. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify Owner/CM of any deficiencies in results or procedures.
13. Witness all or part of any ductwork testing, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify Owner's project manager of any deficiencies in results or procedures.
14. Develop project specific checklist for contractor to complete.
15. Recommend approval of construction checklist completion by selected site observation and spot checking. CxA shall sample 100% of checklists and provide documentation.
16. Recommend approval of systems startup by reviewing startup reports and by selected site observation.
17. Review TAB execution plan, preliminary TAB report, and final TAB report.
18. Oversee sufficient testing of the control system and recommend approval of it to be used for TAB, before TAB is executed.
19. Recommend approval of air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
20. With necessary assistance and review from installing contractors, write the performance test procedures for equipment and systems, including energy management control system trending, stand-alone data logger monitoring or manual performance testing. Submit to CM for review, and for approval if required.
21. Analyze any performance trend logs and monitoring data to verify performance.
22. Coordinate, witness, and recommend approval of manual performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
23. Maintain a Issues Log and a separate testing record. Provide the Owner/ CM with written progress reports and test results with recommended actions.

24. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
25. Oversee and recommend approval of the training of the Owner's operating personnel.
26. Compile and maintain a commissioning record and building systems book(s).
27. Review and recommend approval of the preparation of the O&M manuals.
28. Provide a final commissioning report (as described in this section).
29. Coordinate the development of a systems manual.
30. Prepare a standard trend logging package of primary parameters that will provide the operations staff clear indications of system function in order to identify proper system operation and trouble shoot problems. The CxA shall also provide any needed information on interpreting the trends.
31. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
32. Assist in the development of a preventative maintenance plan, a detailed operating plan or an energy and resource management plan or as-built documentation.
33. Attend lessons learned session.

D. Owner or Owner's Representative

1. Manage the contract of the A/E and of the GC.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions.
3. Provide final approval for the completion of the commissioning work.
4. Facilitate the coordination of the commissioning work by the CxA, and, with the GC and CxA, ensure that commissioning activities are being scheduled into the master schedule.
5. Review and recommend approval of the final Commissioning Plan
6. Attend a commissioning scoping meeting and other commissioning team meetings.
7. Perform the normal review of contractor submittals.
8. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CxA.
9. Review and recommend approval of the performance test procedures submitted by the CxA, prior to testing.
10. When necessary, observe and witness startup and performance testing of selected equipment.
11. Review commissioning progress and deficiency reports.
12. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
13. Sign-off (final approval) on individual commissioning tests as completed and passing. Recommend completion of the commissioning process to the Project Manager.
14. Assist the GC in coordinating the training of Owner personnel.
15. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
16. Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
17. Attend lessons learned session

E. Mechanical and Electrical Designers/Engineers (of the A/E)

1. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One site observation should be completed just prior to system startup.
2. Provide any design narrative and sequences documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

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3. Attend commissioning scoping meetings and other selected commissioning team meetings.
  4. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
  5. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and recommend approval of the O&M manuals.
  6. From the contractor's red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic water, steam and condensate systems; supply, return and exhaust air systems and emergency power system.
  7. Provide a presentation at one of the training sessions for the Owner's personnel.
  8. Review and recommend approval of the construction checklists for major pieces of equipment for sufficiency prior to their use.
  9. Review and recommend approval of the performance test procedure forms for major pieces of equipment for sufficiency prior to their use.
  10. Witness testing of selected pieces of equipment and systems
  11. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.
- F. Each Contractor and their subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
1. Facilitate the coordination of the commissioning and incorporate commissioning activities (the Commissioning Plan) into the Overall Project Schedule.
  2. Provide detailed startup procedures
  3. Include the cost of commissioning in the total contract price.
  4. Ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents and the OPS.
  5. Provide copies of all submittals as required by contract documents including all changes thereto. Attend and participate in commissioning team meetings. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxA, CM, A/E, and PM and Owner to finalize the detailed commissioning procedures/ schedule.
  6. Provide the training of Owner personnel.
  7. Review and accept construction checklists provided by the commissioning authority.
  8. Complete construction checklists as work is completed and provide to CxA.
  9. Accomplish commissioning process test procedures.
  10. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  11. Cooperate with the CxA for resolution of issues recorded in the "Issues Log".
  12. Prepare O&M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions.
  13. Ensure that subcontractors provide assistance for seasonal or deferred performance testing, performed by the CxA, according to the specifications.
  14. Ensure that subcontractors correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.
  15. Perform all guarantee work for materials furnished under the contract for the time specified in the contract, including all warranties and curing all latent defects within the time period provided in the contract.
- G. Vendors/Subcontractors

1. Provide all requested submittal data, including detailed startup procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with subcontractors and/or contractor.
3. Include cost of all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing, operating, and maintaining equipment according to these contract documents in the base bid price to the contractor.
4. Analyze specified products and verify that the A/E has specified the newest, most current equipment reasonable for this project's scope and budget.
5. Provide requested information regarding equipment sequence of operation and testing procedures.
6. Review construction checklists and test procedures for equipment installed by factory representatives.

#### 1.9 EQUIPMENT/SYSTEMS TO BE COMMISSIONED

- A. The following equipment/systems will be commissioned in this project:
1. Water heaters
  2. Circulating pumps
  3. New Temperature Controllers

### **PART 2 - PRODUCTS**

#### 2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required performance testing shall be provided by the contractor for the equipment being tested. This includes, but is not limited to, two-way radios, meters, and data recorders. Data recorders may be provided by the CxA at the option of the CxA.
- B. Special equipment, tools, and instruments required for testing equipment according to these contract documents shall be included in the contractor's base bid price and shall be turned over to the Owner at Project close-out.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration to NIST traceable standards within the past year to an accuracy of 0.5 degree F and a resolution of + or - 0.1 degree F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

### **PART 3 - EXECUTION**

#### 3.1 COMMISSIONING MEETINGS

- A. Initial Meeting. Within 14 days of the Notice to Proceed (NTP), the CxA, through the Owner/CM, will schedule, plan and conduct an initial commissioning meeting. The contractor and its responsible parties are required to attend.
- B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution, and planning issues. These meetings will be held at least monthly, until the final months of construction, when they may be held as frequently as one per week.
- C. Post Occupancy / Warranty Meetings: Meeting will be held weekly until all issues on issues log are resolved and quarterly then after to discuss operation and warranty issues.

### 3.2 STARTUP, CONSTRUCTION CHECKLISTS, AND INITIAL CHECKOUT

- A. The following procedures apply to all equipment/systems to be commissioned, according to Paragraph 1.9 Equipment/Systems to be commissioned.
- B. General. Construction checklists are important to verify that the equipment and systems are fully connected and operational. It ensures that performance testing (in-depth system checkout) may proceed without unnecessary delays. The construction checklists for a given system must be successfully completed and approved prior to startup and formal performance testing of equipment or subsystems of the given system.
- C. Startup and Checkout Plan. The CxA will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed. The CxA shall provide construction checklists and startup shall be identified in the commissioning scoping meeting and on the checklist forms
  1. The construction checklists indicate required procedures to be executed prior to startup and initial checkout of the systems.
  2. The contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.
  3. The contractor/subcontractor with assistance from the CxA responsible for the purchase of the equipment shall develop the full startup plan by combining the manufacturer's detailed startup and checkout procedures and the construction checklists.
  4. The contractor/subcontractor shall submit the full startup plan to the CxA for review and approval.
  5. The CxA will review and recommend approval of the procedures and the documentation format for reporting. The CxA will return the procedures and the documentation format to the contractor, through the CM.
  6. The contractor will transmit the full startup plan to the subcontractors for their review and use.
- D. Sensor and Actuator Calibration. All field-installed temperature, relative humidity, CO, CO<sub>2</sub>, refrigerant, O<sub>2</sub>, and/or pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated. Verify that all locations are appropriate and away from causes of erratic operation. Submit to the CxA through the CM the calibration methods and results. All test instruments shall have had a certified calibration within the last 6 months to NIST traceable standards, and comply with all local, state and/or federal requirements/certifications, as required. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated. Provide bench testing as required at the direction of the CxA.



1. Sensor Calibration Methods

- a. All Sensors-- Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.
- b. Sensors without Transmitters-- Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.
- c. Sensors with Transmitters-- Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

2. Tolerances, Standard Applications

<u>Sensor</u>	<u>Required Tolerance (±)</u>
AHU wet bulb or dew point	2.0F
Hot water coil and boiler water temp	1.5F
Outside air, space air, duct air temps	0.5F
Watt-hour, voltage & amperage	1% of design
Pressures, air, water and gas	3% of design
Flow rates, water	10% of design
Relative humidity	4% of design
Combustion flue temps	5.0F
Oxygen or CO <sub>2</sub> monitor	0.1 % pts
CO monitor	0.01 % pts
Natural gas and oil flow rate	1% of design
Barometric pressure	0.1 in. of Hg

3. Valve and Damper Stroke Setup and Check EMS Readout-- For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
4. Closure for heating coil valves (NO) -- Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set

heating setpoint to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

E. Execution of Construction Checklists and Startup.

1. Four weeks prior to the scheduled startup, the contractor shall coordinate startup and checkout with the CM, A/E, and CxA. The execution and approval of the construction checklists, startup, and checkout shall be directed and performed by the contractor, subcontractor or vendor. Signatures are required of the applicable subcontractors for verification of completion of their work.
2. The Owner/CM, and A/E as necessary, shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, in which case a sampling strategy may be used. The CxA will observe all testing.
3. For lower-level components of equipment, (e.g., sensors, controllers), the CxA shall observe a sampling of the startup procedures.
4. The subcontractors and vendors shall execute startup and provide the CxA and A/E, through the Owner/CM, with a signed and dated copy of the completed startup and construction checklists.
5. Only individuals of the contractor (technicians, engineers, tradesmen, vendors, etc.) who have direct knowledge and witnessed that a line item task on the construction checklist was actually performed shall check off that item. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance, and Approval in Checklists and Startup(Master Issues Log).

1. The contractor shall ensure that the subcontractors clearly list any outstanding items of the initial startup and construction checklist procedures that were not completed successfully, on an attached sheet. The form and any outstanding deficiencies shall be provided, through the Owner/CM, to the CxA within two days of test completion.
2. The CxA will review the report and issue either a non-compliance report or an approval form, through the CM, to the contractor. The installing subcontractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, shall notify the Owner/CM as soon as outstanding items have been corrected, and resubmit an updated startup report with a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA will recommend approval of the execution of the checklists and startup of each system.
3. Items left incomplete, which later cause deficiencies or delays during performance may result in back-charges to the contractor. Refer to Paragraph 3.5, herein, for details.

### 3.3 SUBMITTALS

- A. The CxA will provide appropriate contractors with a specific request for the type of submittal documentation the CxA requires facilitating the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of Owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the commissioning authority. All documentation requested by the CxA will be included by the subcontractors in their O&M manual contributions.

- B. The CxA will review and recommend approval of submittals related to the commissioned equipment for conformance to the contract documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The commissioning authority will notify the Owner/CM, PM or A/E as requested, of items missing or areas that are not in conformance with contract documents and which require resubmission.
- C. The CxA may request additional design narrative from the A/E and controls contractor, depending on the completeness of the OPR documentation and sequences provided with the specifications.
- D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the contractor, though the CxA will review and recommend approval of them.

#### 3.4 TEST, ADJUST, AND BALANCE (TAB) VERIFICATION

- A. Contractor shall submit complete TAB report for CxA, Owner, and AE review. Report will be deemed incomplete if not balanced in compliance with contract documents or if incomplete because of contractor related issues. Once CxA, Owner, and AE verify report is complete, TAB verification will be scheduled.
- B. TAB Report shall comply with NEBB or TAB standard reports and include drawings with inlets and outlets, and pump and fan curves with plotted test data.
- C. TAB report shall have VAV AHU air static pressure setpoints and VFD pump differential water pressure setting recorded on drawings.
- D. TAB report shall have data indicating calibration of airflow monitoring stations. Data shall include a minimum of traverse and corresponding airflow station reading at minimum OA and 100% economizers.
- E. VAV AHU's with control algorithms maintaining minimum OA shall indicate OA traverse data when all VAV's are in heating and VFD is ramped down; traverse data at any steady state condition; and traverse data when VAV's in full cooling and VFD is ramped up.
- F. TAB Verification will consist of the contractor demonstrating a minimum of 10% the systems and equipment balanced are balanced with compliance with the contract documents. Compliance shall be a minimum of +/- 10% , unless specified otherwise by AE. Demonstration will be performed by the contractor with their testing equipment. If the system is found to be out of compliance with the contract documents, the TAB contractor will be required to verify all measured values, and reschedule TAB Verification.
- G. TAB Verification will not be scheduled until all commissioning checklists and start up reports are submitted and approved by the CxA.
- H. Functional performance testing will not be started until TAB Verification is complete.

#### 3.5 CERTIFICATE OF READINESS FORMS

- A. Each Contractor shall sign indicating checklists, startup, TAB, and controls are complete.

- B. Completion of controls shall include a complete and operational system, with recommended trending in place, schedules setup, and all graphic completed.
- C. TAB Verification and Functional performance testing will not begin until forms are complete.

### 3.6 FUNCTIONAL PERFORMANCE TESTING

- A. Requirements. The contractor directed functional performance testing shall demonstrate that each system is operating according to the documented design intent and contract documents. Performance testing facilitates bringing the systems from a state of individual substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
- B. Coordination and Scheduling. The contractor shall provide sufficient notice, regarding their completion schedule for the construction checklists and startup of all equipment and systems to allow the performance testing to be scheduled. The commissioning team shall oversee, witness, and document the performance of all equipment and systems. The CxA in association with the contractor/subcontractors and facility staff shall execute the tests. Performance testing shall be conducted after the construction checklists, and startup has been satisfactorily completed. The control system shall be sufficiently tested and recommend approval of by the CxA before it is used, to verify performance of other components or systems. The air balancing and water balancing shall be completed before performance testing of air or water-related equipment or systems. Testing proceeds from components to sub-systems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems shall be checked.
- C. Development of Test Procedures. Before test procedures are finalized, the contractor shall provide to the A/E and the CxA all requested documentation and a current list of changes affecting equipment or systems, including an updated points list, program code, control sequences, and testing parameters. Using the testing parameters and requirements in the technical specifications, the CxA shall update/develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each contractor/subcontractor or vendor, as appropriate, shall provide assistance to the CxA in developing the final procedures. Prior to finalization, the A/E shall review and concur with the test procedure.
- D. Test Methods.
  - 1. Performance testing and verification may be achieved by manual testing or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CxA may substitute specified methods or require an additional method to be executed other than what was specified, with the approval of the A/E and Owner/CM. The CxA will determine which method is most appropriate for tests that do not have a specified method.
  - 2. Simulated Conditions. Simulating conditions shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
  - 3. Overridden Values. Overriding sensor values to simulate a condition, such as overriding the outside air temperature reading in a control system to be something other than it really is, is acceptable.
  - 4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overridden values.
  - 5. Altering Setpoints. Rather than overriding sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable.

6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the test parameters, that the indirect readings through the control system represent actual conditions and responses.
7. Setup. Each performance test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The contractor/subcontractor(s) assisting the CxA in executing the test shall provide all necessary materials, system modifications, etc., to produce the necessary flows, pressures, temperatures, etc., necessary to execute the test according to the specified conditions. At completion of the test, the contractor/subcontractor(s) shall return all affected equipment and systems to their recommend and approved of operating settings.

- E. Test Equipment. Refer to Part 2 for test equipment requirements.
- F. Problem Solving. The burden of responsibility to solve, correct, and retest malfunctions/failures is with the contractor, with Owner approval as required.

### 3.7 DOCUMENTATION, NON-CONFORMANCE, AND APPROVAL OF TESTS

- A. Documentation. The CxA shall witness and verify/pre-recommend approval of the documentation of the results of all performance tests. The CxA shall complete all documentation for performance testing.

B. Non-Conformance.

1. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form or on an attached sheet.
2. As tests progress and a deficiency is identified, the CxA shall discuss the issue with the commissioning team, and the contractor.

- a. When there is no dispute on the deficiency and the contractor accepts responsibility to correct it:

- 1) The CxA will document the deficiency and the contractor's response and intentions. After the day's work, the CxA will submit the non-compliance reports to the CM. The contractor corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.
- 2) The contractor shall reschedule the test; and the test repeated.

- b. If there is a dispute about a deficiency, regarding whether or not it is a deficiency:

- 1) The dispute shall be documented on the non-compliance form with the contractor's response.
- 2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the construction manager.
- 3) The CxA documents the resolution process.
- 4) Once the interpretation and resolution have been decided, the contractor corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA, through the CM. The contractor

shall reschedule the test and the test repeated until satisfactory performance is achieved.

3. Cost of retesting a performance test is the contractor's.
  4. The contractor shall submit in writing to the CM at least as often as commissioning meetings are being scheduled, the status of each outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.
    - a. The CxA retains the original non-conformance forms until the end of the project.
    - b. Retesting shall not be considered a justified reason for a claim of delay or for a time extension by the contractor.
- C. Failure Due to Manufacturer Defect. If 10% (or three, whichever is greater) of identical pieces of equipment fail to perform to the contract documents (mechanically or substantively) due to a manufacturing defect, not allowing it to meet its submitted performance specification, all identical units may be considered unacceptable by the A/E or CxA. In such case, the contractor shall provide the Owner with the following:
1. Within one week of notification from the Owner/CM, the contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM within two weeks of the original notice.
  2. Within two weeks of the original notification, the contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc., and all proposed solutions. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
  3. The A/E will determine whether a replacement of all identical units or a repair is acceptable.
  4. Two examples, where applicable, of the proposed solution shall be installed by the contractor and the A/E shall be allowed to test the installations for up to one week, upon which the A/E will decide whether to accept the solution.
  5. Upon acceptance, the contractor and/or manufacturer shall replace or repair all identical items, at their expense. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- D. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Final approval of the performance test by the Owner is made after review by the CxA and CM, following recommendations by the A/E.
- 3.8 DEFERRED TESTING
- A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the project completion level, required occupancy condition or other deficiency, execution of checklists and performance testing may be delayed upon approval of the CxA and CM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated. The Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required to reschedule testing due to incomplete installation.
- B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity through the Owner/CM. Tests will be executed by the contractor, documented by the CxA and deficiencies should be corrected by the appropriate

contractor/ subcontractors with the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing shall be made by the contractor.

### 3.9 TRAINING OF OWNER PERSONNEL

- A. The contractor shall provide training coordination, scheduling of subcontractors, and ensure that training is completed. All training shall be coordinated, through the CM, with the CxA.
- B. The contractor shall ensure that each subcontractor and vendor (mechanical, plumbing, fire, electrical, specialty, etc.) shall have the following responsibilities:
  - 1. Provide, to the CxA through the CM, a training plan sixty days before the planned training covering the following elements:
    - a. Equipment
    - b. Intended audience
    - c. Location of training
    - d. Objectives
    - e. Subjects covered (description, duration of discussion, special methods, etc.)
    - f. Duration of training on each subject
    - g. Instructor for each subject
    - h. Methods (classroom lecture, manufacturer's quality video, site walk-through, actual operational demonstrations, written handouts, etc.).
  - 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment that makes up the system.
  - 3. Training shall normally start with classroom sessions followed by hands-on demonstration/training on each piece of equipment.
  - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated at another scheduled time, if necessary.
  - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
  - 6. The controls contractor shall attend sessions other than the controls training, as specified, to discuss the interaction of the controls system as it relates to the equipment being discussed.
  - 7. The training sessions shall follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
  - 8. Training shall include:
    - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include startup, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
    - c. Discussion of relevant health and safety issues and concerns.
    - d. Discussion of warranties and guarantees.
    - e. Common troubleshooting problems and solutions.
    - f. Explanatory information included in the O&M manuals.

- g. Discussion of any peculiarities of equipment installation or operation.
      - h. Classroom sessions shall include the use of overhead projections, slides, video/audiotaped material as might be appropriate.
      - i. Hands-on training shall include startup, operation in all modes possible, including manual, shut-down, alarms, power failure and any emergency procedures, and preventative maintenance for all pieces of equipment.
    - 9. The contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls not controlled by the central control system.
  - C. At the discretion of the CxA, training may occur before performance testing is complete if required by the facility operators to assist the CxA in the performance testing.
  - D. Videotaping of the training sessions will be provided by the contractor and added to the O&M manuals. In addition, factory training videos identifying key troubleshooting, repair, service and/or replacement techniques shall be provided and reviewed with the Owner.
  - E. The CxA at the beginning of each training session presents the overall system narrative and the design concept of each equipment section.
- 3.10 OPERATIONS AND MAINTENANCE MANUALS / DATA
- A. The commissioning process requires detailed O&M documentation as identified in this section and technical specifications.
  - B. O&M documentation shall comply with 2015 IECC C408.2.5.2 "Manuals".
  - C. Contractor shall submit complete operating and maintenance manuals in electronic format (PDF) for CxTeam review within 60 calendar days after review of equipment submittals. Electronic manuals shall be identical in contents to a printed manual: with title/cover page, table of contents, tabbed/bookmarked sections, etc. Separate files for each piece of equipment will not be accepted.
  - D. Approved O&M's shall be installed linked to on the building operation system.
  - E. Contractor shall submit corrected final approved manuals prior to scheduling training sessions. Prior to final submittal, the CxA shall review the O&M manuals (in addition to the initial draft O&M manual), and documentation, with redline as-builts, for systems that were commissioned to verify compliance with the specifications. The CxA will communicate, through the CM, deficiencies in the manuals to the contractor or A/E, as requested. The CxA will also review each equipment warranty and verify that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.
  - F. The contractor shall compile O&M manuals in accordance with all Specifications.
    - 1. For equipment, subsystems, and systems to be commissioned, the contractor will include the following:
      - a. Operation and Maintenance Instructions. These shall be the written manufacturer's data with the model and features of this installation clearly marked and edited to omit reference to products or data not applicable to this installation. This section shall include data on the following:



- 1) Approved submittal, including model number, serial number and nameplate data for each piece of equipment and any subcomponent.
  - 2) Installation, startup and break-in instructions.
  - 3) All starting, normal shutdown, emergency shutdown, manual operation and normal and emergency operating procedures and data, including any special limitations.
    - a) Step-by-step procedure for system startup, including a pre-start checklist. Refer to controls and indicators by nomenclature consistent with that used on panels and in control diagrams.
    - b) Sequence of operation, with detailed instruction in proper sequence, for each mode of operation (i.e., day-night; staging of equipment).
    - c) Emergency operation: If some functions of the equipment can be operated while other functions are disabled, give instructions for operations under these conditions. Include here only those alternate methods of operations (from normal) which the operator can follow when there is a partial failure or malfunctioning of components, or other unusual condition.
    - d) Shutdown procedure: Include instructions for stopping and securing the equipment after operation. If a particular sequence is required, give step-by-step instructions in that order.
2. Building Operational Data:
- a. Provide a schedule for preventive maintenance in a printed format and an electronic format compatible with Owner's system. State, preferably in tabular form, the recommended frequency of performance for each preventive maintenance task, cleaning, inspection and scheduled overhauls. One comprehensive schedule indicating routine maintenance frequencies. Schedule shall indicate maintenance requirements for 2-calendar years starting from date of Owner acceptance.
  - b. Lamp Schedule: One comprehensive schedule indicating lamps for all luminaires on the project and their types and quantities, manufacturers, and order codes.
  - c. Warranty Schedule: One comprehensive schedule listing all equipment on project and their parts, labor, and extended warranties.
  - d. Spare parts list: List shall include all spare parts that the contractor recommends the Owner to have for emergencies. List should include any items included in contract documents.
3. Safety Precautions: This subsection shall comprise a listing of safety precautions and instructions to be followed before, during and after making repairs, adjustments or routine maintenance.
4. Manufacturers' brochures (including controls): Manufacturers' descriptive literature covering devices and equipment used in the system, together with illustrations, exploded views and renewal parts lists. Manufacturers' standard brochures and parts list shall be corrected so that information applying to the actual installed equipment is clearly defined.
5. Supply any special tools required to service or maintain the equipment.
6. Performance data, ratings and curves.
7. Warranty and guarantee, which clearly lists conditions to be maintained to keep warranty in effect and conditions that would affect the validity of the warranty.
8. Any service contracts issued.
9. Supplemental Data. Prepare written text and/or special drawings to provide necessary information, where manufacturer's standard printed data is not available and information is necessary for a proper understanding and operation and maintenance of equipment or systems, or where it is necessary to provide additional information to supplement data included in the manual or project documents.

10. Control Diagrams/Drawings. Include the as-built control diagrams/drawings for the piece of equipment and its components, including full points list, full print out of all schedules and set points after testing and acceptance of the system, and copies of all checkout tests and calibrations performed by the contractor (not commissioning tests). Plans shall include location of all controllers, sensors, and BAS connections.
11. Record Drawings: Record drawings shall include all changes, RFI's, PR's, ASI's, substitutions, etc., in addition to field modifications.
12. TAB: this section shall include complete approved TAB report. TAB report airflows and water flows need to match submittals when they are approved different than design.
13. System Description. This section shall include the individual equipment portion of the overall system Design Basis Narrative.

### 3.11 Cx DOCUMENTS

- A. The commissioning process generates a number of written work products described in various parts of the Specifications. The Commissioning Plan—Construction Phase, lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

**Product: Developed By**

1. Commissioning schedules: GC / Contractor
2. Equipment documentation submittals: Subs
3. Sequence clarifications: Subs and A/E as needed
4. Pre-functional checklists: CxA
5. Startup plan: Subs and CxA
6. Startup and checklist forms filled out : Subs
7. Final TAB report: TAB
8. Issues log (deficiencies): CxA
9. O&M manuals: GC / Subs
10. Functional test forms: CxA
11. Completed /filled out functional tests : CxA
12. Overall training plan: Contractor
13. Specific training agendas: Subs
14. Final commissioning report: CxA

### 3.12 EXCLUSIONS

- A. The Owner's representative and Owner's Commissioning Agent are not responsible for construction means, methods, job safety, or any management function related to commissioning on the job site.

**END OF SECTION 01 91 00**

## **SECTION 09 91 23 - PAINTING**

### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems.

#### 1.2 SCOPE

- A. General
  - 1. Patch and paint walls and ceilings affected by demolition and new work. Painting shall consist of painting entire wall, ceiling, floor, surface, or plane affected.
  - 2. Paint color and sheen shall match adjacent surfaces.

#### 1.3 DEFINITIONS

- A. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- C. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.
- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURER'S

- A. Diamond Vogel

- B. Sherwin Williams

## 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 1. Flat Paints and Coatings: 50 g/L.
  - 2. Nonflat Paints and Coatings: 150 g/L.
  - 3. Dry-Fog Coatings: 400 g/L.
  - 4. Primers, Sealers, and Undercoaters: 200 g/L.
  - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
  - 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
  - 7. Pretreatment Wash Primers: 420 g/L.
  - 8. Floor Coatings: 100 g/L.
  - 9. Shellacs, Clear: 730 g/L.
  - 10. Shellacs, Pigmented: 550 g/L.
- D. Color:
  - 1. Iron Stone -Eggshell 200
  - 2. Match existing / adjacent surface for patched surfaces.

## 2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.

## 2.4 PRIMERS/SEALERS

- A. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.

## 2.5 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107.
- B. Primer, Alkyd, Anti-Corrosive, for Metal: MPI #79.
- C. Primer, Alkyd, Quick Dry, for Metal: MPI #76.

- D. Primer, Galvanized, Water Based: MPI #134.

## 2.6 WATER-BASED PAINTS

- A. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 2): MPI #144.
- B. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 3): MPI #145.
- C. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5): MPI #147.

## 2.7 SOLVENT-BASED PAINTS

- A. Alkyd, Interior, Gloss (Gloss Level 6): MPI #48.

## 2.8 FLOOR COATINGS

- A. Floor Paint, Latex, Low Gloss (Maximum Gloss Level 3): MPI #60.

# **PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Gypsum Board: 12 percent.
  - 5. Plaster: 12 percent.
- C. Provide moisture readings as part of close out documentation.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

## 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- C. Paint exposed exterior gas piping
- D. Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - 1. Paint the following work where exposed in equipment rooms:
    - a. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - 2. Paint the following work where exposed in occupied spaces:
    - a. Equipment
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - h. Other items as directed by Engineer.
  - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Engineer, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

B. Concrete Substrates, Traffic Surfaces:

1. Latex Floor Enamel System:

- a. Prime Coat: Floor paint, latex, low gloss (maximum Gloss Level 3), MPI #60.
- b. Intermediate Coat: Floor paint, latex, low gloss (maximum Gloss Level 3), MPI #60.
- c. Topcoat: Floor paint, latex, low gloss (maximum Gloss Level 3), MPI #60.

C. Clay-Masonry Substrates:

1. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

D. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System:

- a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

E. Steel Substrates:

1. Alkyd System:

- a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79 or primer, alkyd, quick dry, for metal, MPI #76.
- b. Intermediate Coat: Alkyd, interior, matching topcoat.
- c. Topcoat: Alkyd, interior, gloss (Gloss Level 6), MPI #48.

F. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer, galvanized, water based, MPI #134.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

G. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

H. Wood Substrates: Including wood trim, Engineerural woodwork, doors, windows, wood-based panel products, glued-laminated construction, exposed joists, exposed beams

1. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer, latex, for interior wood, MPI #39.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

I. Gypsum Board and Plaster Substrates:

1. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.
- d.

J. Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings

1. Institutional Low-Odor/VOC Latex System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Water-Based Light Industrial Coating System:



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- a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
  - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
  - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #163.
2. Alkyd System:
- a. Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79.
  - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
  - c. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.
- B. Galvanized-Metal Substrates:
1. Alkyd System:
    - a. Prime Coat: Primer, galvanized metal, as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    - c. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.
- C. Aluminum Substrates:
1. Alkyd System:
    - a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    - c. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.

**END OF SECTION 09 91 23**

## **SECTION 22 00 00 - PLUMBING GENERAL PROVISIONS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. This Section applies to all Division 22 (plumbing) work.
- B. Related Documents: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements applies to all Division 22 work.

#### **1.2 COORDINATION BETWEEN SPECIFICATION SECTIONS**

- A. Each specification section within their respective division shall be coordinated with all other sections in that division for related work.

#### **1.3 COORDINATION OF WORK**

- A. General:
  - 1. Refer to the Division 1 sections for general coordination requirements applicable to the entire work. The contractor shall recognize that the contract documents are diagrammatic in showing certain physical relationships which must be established within the plumbing, mechanical and electrical work, and in its interface with other work including utilities and that such establishment is the exclusive responsibility of the Contractor. Because the drawings are diagrammatic and on a small scale, all rises, drops, offsets, etc., have not been shown. The Contractor shall agree to provide and install the necessary conduit, piping, fittings, valves, ducts, and other specialties to suit such conditions without additional cost to the Owner.
  - 2. Piping and conduits, except electrical conduits run in floor construction, suspended ceiling space, or roof space shall be run parallel with lines of the building unless otherwise noted on drawings. Water supply pipes, where practicable, shall be placed at same elevation and hung on multiple hangers. Electric conduits shall not be hung on hangers with any other service, unless approved by the Engineer and shall be hung above all other service pipes. The different service pipes, valves, fittings, and similar items, shall be so installed that after the covering is applied there will be not less than 1/2" clear space between the finished covering and other work and between the finished covering of parallel adjacent pipes. Hangers on different service lines running close to and parallel with each other shall be in line with each other and parallel to the lines of the building. Exact location of electric outlets, piping, ducts, and the like shall be coordinated to avoid interferences between lighting fixtures, piping, ducts, and similar items.
  - 3. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical and electrical work with adequate access for operation and maintenance.
  - 4. Give right-of-way to piping which must slope for drainage.
  - 5. Advise other trades of openings required in their work for the subsequent move-in of large units of plumbing, mechanical and electrical work (equipment).
  - 6. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Coordination Drawings:

1. For locations where several elements of plumbing (or combined plumbing, mechanical and electrical) work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual physical dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.
2. Install equipment and materials to provide required access for servicing and maintenance.

C. Contract Document Discrepancies:

1. If work is required in manner to make it impossible to produce first class work, or should discrepancies appear among contract documents, request interpretation before proceeding with work. If Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out work in satisfactory manner. Should conflict occur in or between drawings, and specifications, Contractor is deemed to have estimated on more expensive way of doing work unless he shall have asked for and obtained written decision before submission of proposal as to method or materials required.

1.4 FEES, PERMITS, LICENSES, UTILITY CONNECTION CHARGES, AND UTILITY COST.

- A. The Contractor shall obtain and pay for all fees, permits, licenses, utility connection charges (water, sanitary sewer, storm sewer and gas) and utility cost for services to the building required.
- B. The Contractor shall maintain all necessary signal lights, guard against danger and use all proper means for the safety of the public.
- C. The Contractor shall pay for opening and repairing all pavement cuts.
- D. The Contractor shall furnish to the Architect copies of all fees, permits and licenses required for all plumbing work herein specified before any plumbing work is started.

1.5 CONTRACTORS RESPONSIBILITY FOR CONSULTANTS ADDITIONAL SERVICES

- A. The Consultant is entitled to compensation for additional services not included in their contract but provided on this project. Since our contract is with the Owner or Architect, the Owner or Architect has the responsibility to compensate us for these additional services. The Consultant will provide, without advance authorization from the Client, the Additional Services listed below. These services will be tracked in our office and billed to the Client upon completion of the project. The client will in turn deduct the sum of these additional services from the contractors final payment. The following is a list of services that have been included in our contract with the client along with a description of services that will be charged against the contractors final payment due to services brought about due to the contractors actions:
  1. Re-submittals: The consultant has included in their contract with our Client, one (1) review for each submittal item. The contractor is required to carefully review each submittal from their suppliers and subcontractors for compliance with the contract documents along with a written notice of deviations of any type prior to submitting them to the Engineer for review. The Contractor shall be responsible to the Client for all

reasonable costs charged by the Consultant to the Client for the Additional Services required for re-submittals.

2. Substitutions: The Consultant has included in their contract with our Client, incorporation of minor changes to the contract documents to develop record documents in electronic format. These changes are limited to unforeseen site conditions and clarifications to the contract documents. Review of substitutions for compliance with the contract documents, and services required to modify and coordinate changes required due to contractor substitutions or deviations from the contract documents are not included in our contract with the Client. The Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required to modify and coordinate documents or provide field coordination due to contractor substitutions or deviations from the contract documents.
3. Requests For clarification or Interpretation (RFI): The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The Consultant shall, with reasonable promptness, respond to such Contractor's request for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract Documents or is reasonably inferable from them, the Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required to provide such information.
4. Construction Meetings & Site Observations: The consultant has included a predetermined number of construction meetings and site observations in their contract with the owner based on the anticipated construction period specified. However if additional construction meetings and site observations are required due to the contractors delay in completion of the project, the Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required to attend additional construction meetings or provide additional site observations.
5. Re-inspections: The contractor is responsible to prepare a final punch list for the project and to correct all items prior to calling for a final inspection from the consultant. Upon being notified, the consultant will then visit the site and prepare a final punch list. The contractor is then required to correct all items on the consultants final punch list and call for a re-inspection of the project. If all items have not been corrected, the final punch list will be updated and additional re-inspections will be required. However if additional re-inspections are required, the Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required for the additional re-inspections.

#### 1.6 SINGULAR NUMBER

- A. Where any device or part of equipment is herein referred to in the singular number (such as "the pump"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

#### 1.7 CLEANING AND PROTECTION

- A. General: During handling and installation of work at project site, each contractor shall clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

1.8 MAINTENANCE AND OPERATION MANUALS

- A. Prepare and submit four (4) copies of maintenance and operation instructions for all Division 22 equipment furnished. Organize maintenance and operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and indexed (thumb-tabbed). Include emergency instructions, spare parts listing, copies of warranties, wiring diagrams, recommended "turn-around" cycles, inspection procedures, shop drawings, product data, and similar application information. Bind each manual of each set in a heavy-duty 2", 3-ring vinyl-covered binder, and include pocket folders for folded sheet information. Mark identification on both front and spine of each binder.

1.9 PROJECT CLOSE OUT

- A. General: Refer to the Division 1 sections for general closeout requirements. Maintain a daily log of operational data on mechanical equipment and systems through the closeout period; record hours of operation, assigned personnel, fuel consumption and similar information; submit copy to Owner.
- B. Record Drawings: For Division 22 work, give special attention to the complete and accurate recording of underground conduit and piping other concealed and non-accessible work, branching arrangement and valve location for piping systems, locations of control system sensors and other control devices, and work of change orders where not shown accurately by contract documents.
- C. Closeout Equipment/Systems Operations: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operate each item of equipment and each system in a test run of appropriate duration with the Owner's operating personnel present, to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system, and replace excessively worn parts and similar expendable items of the work.
- D. Operating Instructions: Conduct a full-day walk-through instruction seminar for the Owner's personnel to be involved in the continued operation and maintenance of plumbing equipment and systems. Explain the identification system, operational diagrams, emergency and alarm provisions, sequencing requirements, security, safety, efficiency and similar features of the systems.
- E. Turn-Over of Operation: At the time of substantial completion, turn over the prime responsibility for operation of the plumbing equipment and systems to the Owner's operating personnel.

1.10 FINAL COMPLETION

- A. The following special requirements shall be provided in addition to these specifications elsewhere in these specifications:
  - 1. The Division 22 Contractors shall not call for a final completion check until the entire Plumbing, Mechanical and Electrical Equipment and Systems have been installed, adjusted, balanced and in full and complete satisfactory operation and the following certifications of inspection from equipment suppliers have been completed and submitted to the Architect/Engineer. Certifications of Inspections for Division 22 Equipment are required on the following items of equipment:
    - a. Plumbing fixtures & equipment (Local Rep)

- b. Domestic water heaters (Local Rep)
  - c. Pumps (Local Rep)
- B. The Certifications shall consist of letters signed by Factory Trained and Authorized Service Engineers stating the following:
  - 1. They have inspected all of their equipment on the project.
  - 2. They approve the condition of the equipment and its installation.
  - 3. They have fully checked its operation and certify that it is operating properly.
  - 4. They will note any problems, conditions or objections that could lead to future operating problems.
  - 5. Log Sheets shall be provided on start-up of all plumbing equipment. Factory trained representative shall certify log sheets.
  - 6. Units shall be inspected by all concerned and certify the installation and operation of the associated equipment. Certification to come from the local rep and the factory.
- C. Exceptions may be permitted upon written request from the Contractor listing any minor items that are uncompleted and beyond his reasonable control. The full guarantee that they will be completed at a named later date and the guarantee extended as required to provide a full warranty.

#### 1.11 FINAL PAYMENT

- A. Final Payment will not be made until the Contractor has satisfactorily completed all final inspection items.

#### 1.12 GUARANTEE

- A. The one-year guarantee period shall not start until the project is fully completed and the Contractor has received the Final Payment and Certification of Completion.
- B. All equipment and all work shall be fully guaranteed, parts, and labor, for one full year from the date of the Certificate of Completion. Repairs made during this period must be fully guaranteed for an additional one year period from the date of repairs.
- C. The Division 22 Contractor has the full responsibility to guarantee all equipment, work and shall assume full responsibility to repair any equipment at his cost that the manufacturer refuses to guarantee.
- D. The Owner has the right to order repairs to any equipment or work provided hereon and to charge the Contractor for same if repairs are not made by the Contractor within a reasonable period of time not to exceed 24 hours during an emergency or 72 hours on a non-critical item.
- E. Where equipment is furnished by the owner and installed by the contractor, the contractors responsibilities shall remain as indicated above except that the owner will assist in enforcing the stipulated manufacturer's warranty.

### **PART 2 - PRODUCTS (Not Applicable)**

### **PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION 22 00 00**

## **SECTION 22 01 00 – PLUMBING SUBMITTALS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. See Section 08 31 00 for Access Panels

#### **1.2 GENERAL**

- A. Shop drawing Submittals shall comply with the requirements of Division 1, Section 01 33 00, and with the requirements of this Section. Shop Drawing Submittals shall include specially-prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to a range of similar projects. Performance curves shall show the full operating range of the proposed equipment
- B. Shop Drawing Submittals shall also include product data which includes standard printed information on materials, products and systems; not specially-prepared for this project, but with the designation of selections from among available choices for this project clearly identified.

#### **1.3 SUBMITTAL REQUIREMENTS**

- A. Coordination and Sequencing: Coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for same work, and for interfacing units of work, so that one will not be delayed for coordination of Architect/Engineer's review with another.
- B. Preparation of Submittals: Provide permanent marking on each submittal to identify project, date, contractor, subcontractor, submittal name and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking and provide space for Architect's/Engineer's "Action" marking. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through Contractor's office will be returned by Architect/Engineer "without action".
- C. Provide Contractor's certification on form, ready for execution, stating that information submitted complies with requirements of contract documents. Failure to fully review submittals for compliance with contract documents may result in rejection by the Architect/Engineer requiring re-submittal by the contractor. Contractor shall pay the Architect/Engineer for review of all re-submittals in accordance with Section 22 00 00 "Plumbing General Provisions".

#### **1.4 SUBMITTAL LIST**



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A. Shop drawings shall be submitted for, but not limited to, the items listed in each section of the specifications. Submittals, in addition to those listed, may be required by the Architect/Engineer. The following is a summary list of submittals required for the project.

<b>SECTION</b>	<b>ITEM</b>	<b>DATE RECEIVED BY A/E</b>	<b>TRANSMITTAL NO.</b>	<b>DATE RETURNED</b>
22 00 00	Record Drawings			
22 00 00	Maintenance & Operations Manuals			
22 05 00	Plumbing Identification			
22 05 23	General Duty Valves For Plumbing Piping			
22 07 00	Plumbing Insulation Materials			
22 11 16	Domestic Water Piping			
22 11 16	Balancing Valves & Cocks			
22 11 16	Mixing Valves			
22 14 29	Plumbing Pumps			
22 33 00	Domestic Expansion Tank			
22 33 00	Water Heater			

**END OF SECTION 22 01 00**

## **SECTION 22 05 00 - BASIC PLUMBING MATERIALS AND METHODS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Extent of basic plumbing materials and methods work required by this section is indicated on drawings and schedules, and/or specified in other Division-22 sections.
- B. Types of basic plumbing materials and methods specified in this section include the following:
  - 1. Plumbing equipment nameplate data.
  - 2. Selective demolition including:
    - a. Nondestructive removal of materials and equipment for reuse or salvage as indicated.
    - b. Dismantling plumbing materials and equipment made obsolete by these installations.
  - 3. Excavation for underground utilities and services, including underground piping (under the building and from building to utility connection), tanks, basins, and equipment.
  - 4. Miscellaneous metals for support of plumbing materials and equipment.
  - 5. Joint sealers for sealing around plumbing materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.
  - 6. Access panels and doors in walls, and ceilings for access to plumbing materials and equipment.
  - 7. Plumbing Identification of plumbing materials and equipment.
  - 8. Concrete for floor patching, equipment bases, etc.
  - 9. Painting of plumbing materials and equipment.

#### **1.2 DEFINITIONS**

- A. The following definitions apply to excavation operations:
  - 1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.
  - 2. Subbase: as used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.
  - 3. Subgrade: as used in this Section refers to the compacted soil immediately below the slab or pavement system.
  - 4. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Architect/Engineer.

#### **1.3 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract, Division 1 Specification Sections, and Section 22 01 00.

- B. Product data for the following products:
  - 1. Access panels and doors. See Section 08 31 00 for Access Panels
  - 2. Joint sealers.
- C. Shop drawings detailing fabrication and installation for metal fabrications, and wood supports and anchorage for plumbing materials and equipment.
- D. Coordination drawings for access panel and door locations.
- E. Samples of joint sealer, consisting of strips of actual products showing full range of colors available for each product.
- F. Welder certificates, signed by Contractor, certifying that welders comply with requirements specified under "Quality Assurance" article of this Section.
- G. Schedules indicating proposed methods and sequence of operations for selective demolition prior to commencement of Work. Include coordination for shut-off of utility services and details for dust and noise control.
  - 1. Coordinate sequencing with construction phasing and Owner occupancy specified in Division 1 Section "Summary of Work."

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer for the installation and application of joint sealers, access panels, and doors.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating shown.
  - 1. Provide UL Label on each fire-rated access door.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver joint sealer materials in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle joint sealer materials in compliance with the manufacturers' recommendations to prevent their deterioration and damage.

#### 1.6 PROJECT CONDITIONS

- A. Conditions Affecting Selective Demolition: The following project conditions apply:
  - 1. Protect adjacent materials indicated to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
  - 2. Locate, identify, and protect plumbing services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.
- B. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits permitted by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

#### 1.7 SEQUENCE AND SCHEDULING

- A. Coordinate the shut-off and disconnection of utility services with the Owner and the utility company.
- B. Notify the Architect/Engineer and Owner at least 5 days prior to commencing demolition operations.
- C. Perform demolition in phases as indicated.

### **PART 2 - PRODUCTS**

#### 2.1 PLUMBING EQUIPMENT NAMEPLATE DATA

- A. Nameplate: For each piece of power operated plumbing equipment provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

#### 2.2 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.
- F. Fasteners: Zinc-coated, type, grade, and class as required.

#### 2.3 MISCELLANEOUS LUMBER

- A. Framing Materials: Standard Grade, light-framing-size lumber of any species. Number 3 Common or Standard Grade boards complying with WCLIB or AWPA rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent.
- B. Construction Panels: Plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than 15/32 inches.

#### 2.4 JOINT SEALERS

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.
- B. Colors: As selected by the Architect from manufacturer's standard colors.
- C. Elastomeric Joint Sealers: Provide the following types:
  - 1. One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.
  - 2. One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes.
  - 3. Products: Subject to compliance with requirements, provide one of the following:
    - a. One-Part, Nonacid-Curing, Silicone Sealant:
      - 1) "Chem-Calk N-Cure 2000," Bostic Construction Products Div.
      - 2) "Dow Corning 790," Dow Corning Corp.
      - 3) "Silglaze N SCS 2501," General Electric Co.
      - 4) "Silpruf SCS 2000," General Electric Co.
      - 5) "864," Pecora Corp.
      - 6) "Rhodorsil 5C," Rhone-Poulenc, Inc.
      - 7) "Spectrum 1," Tremco, Inc.
      - 8) "Spectrum 2," Tremco, Inc.
      - 9) "Dow Corning 795," Dow Corning Corp.
      - 10) "Rhodorsil 6B," Rhone-Poulenc, Inc.
      - 11) "Rhodorsil 70," Rhone-Poulenc, Inc.
      - 12) "Omnisea," Sonneborn Building Products Div.
      - 13) "Chem-Calk 100," Bostic Construction Products Div.
      - 14) "Gesil N SCS 2600," General Electric Co.
    - b. One-Part, Mildew-Resistant, Silicone Sealant:
      - 1) "Dow Corning 786," Dow Corning Corp.
      - 2) "SCS 1702 Sanitary," General Electric Co.
      - 3) "863 #345 White," Pecora Corp.
      - 4) "Rhodorsil 6B," Rhone-Poulenc, Inc.
      - 5) "Proglaze White," Tremco, Inc.
      - 6) "OmniPlus," Sonneborn Building Products Div.

- D. Acrylic-Emulsion Sealants: One-part, nonsag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Chem-Calk 600," Bostic Construction Products Div.
    - b. "AC-2-," Pecora Corp.
    - c. "Sonolac," Sonneborn Building Products Div.
    - d. "Tremco Acrylic Latex 834," Tremco, Inc.

## 2.5 FIRE BARRIER PENETRATIONS

- A. General: All cracks, voids, or holes for the passing of plumbing, mechanical and electrical items through fire rated floors, walls and ceilings and having a fire rating of 1 hour or more shall be sealed with a fire barrier caulk, putty, or sealant. Caulk, putty, and sealant systems shall be installed in accordance with the manufacturers recommendations to maintain a fire rating of 3 hours minimum.
- B. Fire-Resistant Joint Sealers: Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors. Sealants and accessories shall have fire-resistant ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.
- C. Fire-Resistant Caulk:
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Dow Corning Fire Stop Foam," Dow Corning Corp.
    - b. "Pensil 851," General Electric Co.
    - c. "3M" CP 25 Caulk or 303 Putty

## 2.6 ACCESS DOORS

- A. See Section 08 31 00 Access Panels for more information.
- B. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.
- C. Frames: 16-gauge steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling.
1. For installation in masonry, concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors.
  2. For gypsum wallboard or plaster: perforated flanges with wallboard bead.
  3. For full-bed plaster applications: galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
- D. Flush Panel Doors: 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.

1. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.

E. Locking Devices: Flush, screwdriver-operated cam locks.

## 2.7 PLUMBING IDENTIFICATION

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.

B. Equipment nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
2. Location: Accessible and visible location.

C. Stencils: Standard stencils, prepared for required applications with letter sizes complying with recommendations of ASME A13.1 for piping and similar applications and not less than 3/4-inch-high letters for access door signs and similar operational instructions.

1. Material: Fiberboard.
2. Material: Brass.
3. Stencil Paint: Standard exterior-type stenciling enamel; black, unless otherwise indicated; either brushing grade or pressurized spray-can form and grade.
4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.

D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semi-rigid, snap on, color-coded, complying with ASME A13.1.

E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.

F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine sub-core, unless otherwise indicated.

1. Fabricate in sizes required for message.
2. Engrave with engraver's standard letter style, of sizes and with wording to match equipment identification.
3. Punch for mechanical fastening.
4. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches long; 1/8 inch for larger units.
5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

G. Plastic Equipment Markers: Color-coded, laminated plastic. Comply with the following color code:

1. Green: Cooling equipment and components.

2. Yellow: Heating equipment and components.
  3. Yellow/Green: Combination cooling and heating equipment and components.
  4. Brown: Energy reclamation equipment and components.
  5. Blue: Equipment and components that do not meet any criteria above.
  6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
  7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
    - d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.
  8. Size: Approximate 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by inches for equipment.
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in plumbing identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of plumbing systems and equipment.
1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Water Heater No. 1," "Pump No. 1," or "Water Softener No. 1."
- I. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
  2. Yellow: Gas, oil, steam, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems.
  5. Green: Sewer systems.
- 2.8 PAINING, FINISHING
- A. Painting of plumbing, mechanical and electrical work exposed in occupied spaces, except plumbing, mechanical and electrical machine rooms and maintenance/service space; and work exposed on the exterior is specified and performed under other divisions of these specifications.
  - B. Factory finishes, shop painting, and special protective coatings are specified in the individual equipment specification sections.
  - C. Where factory finishes are provided on equipment and no additional field painting is specified, all marred or damaged surfaces shall be touched up or refinished so as to leave a smooth, uniform finish at the time of final inspection.

### **PART 3 - EXECUTION**



### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers and access panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION FOR JOINT SEALERS

- A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.
- B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 SELECTIVE DEMOLITION

- A. General: Demolish, remove, demount, and disconnect abandoned plumbing materials and equipment indicated to be removed and not indicated to be salvaged or saved.
- B. Materials and Equipment to be Salvaged: Remove, demount, and disconnect existing plumbing materials and equipment indicated to be removed and salvaged, and deliver materials and equipment to the location designated for storage by Owner.
- C. Disposal and Cleanup: Remove from the site and legally dispose of demolished materials and equipment not indicated to be salvaged.
- D. Plumbing Materials and Equipment: Demolish, remove, demount, and disconnect the following items:
  - 1. Inactive and obsolete piping, fittings and specialties, equipment, ductwork, controls, fixtures, and insulation.
    - a. Piping and ducts embedded in floors, walls, and ceilings may remain if such materials do not interfere with new installations. Remove materials above accessible ceilings. Drain and cap piping and ducts allowed to remain.
  - 2. Perform cutting and patching required for demolition in accordance with Division 1 Section "Cutting and Patching."

### 3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code."

### 3.5 APPLICATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
  - 1. Comply with recommendations of ASTM C 962 for use of elastomeric joint sealants.
  - 2. Comply with recommendations of ASTM C 790 for use of acrylic-emulsion joint sealants.
- B. Tooling: Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
- C. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around plumbing services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

### 3.6 INSTALLATION OF ACCESS DOORS

- A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.
- B. Adjust hardware and panels after installation for proper operation.

**END OF SECTION 22 05 00**

## **SECTION 22 05 19 – METERS AND GAGES FOR PLUMBING PIPING**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Extent of meters and gages required by this section is indicated on drawings and/or specified in other Division-22 sections.
- B. Types of meters and gages specific in this section include the following:
  - 1. Temperature Gages and Fittings.
    - a. Bimetallic-Actuated Dial Thermometers.
    - b. Solar Powered Digital Thermometers/Transmitters.
    - c. Thermometer Wells.
    - d. Temperature Gage Connector Plugs.
  - 2. Pressure Gages and Fittings.
    - a. Pressure Gages.
    - b. Pressure Gage Cocks.
    - c. Pressure Gage Connector Plugs.
  - 3. Calibrated Balance Valves.
- C. Meters and gages furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division-22 sections.

#### **1.2 QUALITY ASSURANCE**

- A. Manufacturers Qualifications: Firms regularly engaged in manufacturer of meters and gages, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
  - 1. UL Compliance: Comply with applicable UL standards pertaining to meters and gages.
  - 2. ANSI and ISA Compliance's: Comply with applicable portions of ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.
- C. Certification: Provide meters and gages whose accuracies, under specified operating conditions, are certified by manufacturer.

#### **1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of meter and gage. Include scale range, ratings, and calibrated performance

curves, certified where indicated. Submit meter and gage schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gage.

- B. Maintenance Data: Submit maintenance data and spare parts lists for each type of meter and gage. Include this data and product data in Maintenance Manual; in accordance with requirements of Section 22 00 00.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Products: Subject to compliance with requirements, provide one of the following:
1. Bimetallic-Actuated Dial Thermometers:
    - a. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
    - b. Ernst Gage Co.
    - c. Eugene Ernst Products Co.
    - d. Marsh Bellofram.
    - e. Noshok, Inc.
    - f. Terice, H. O. Co.
    - g. Winters
    - h. Weiss Instruments, Inc.
    - i. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
  2. Solar Powered Digital Thermometers/Transmitters:
    - a. Weiss Instruments, Inc.
    - b. Winters Instruments
  3. Pressure Gages:
    - a. Ametek/U.S. Gauge
    - b. Marsh Instrument Co., Unit of General Signal.
    - c. Marshalltown Instruments, Inc.
    - d. Terice (H.O.) Co.
    - e. Weiss Instruments, Inc.
  4. Temperature and Pressure Gage Connector Plugs:
    - a. Peterson Engineering Co.
  5. Calibrated Balance Valves:
    - a. Bell & Gossett ITT; Fluid Handling Div.
    - b. Taco, Inc.
    - c. Thrush Products, Inc.

### **2.2 BIMETALLIC-ACTUATED DIAL THERMOMETERS**

- A. Description: Direct-mounting, bimetallic-actuated dial thermometers complying with ASME B40.3.

- B. Case: Dry type, stainless steel with 5-inch diameter.
- C. Element: Bimetal coil.
- D. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
- E. Pointer: Red metal.
- F. Window: Glass.
- G. Ring: Stainless steel.
- H. Connector: Adjustable angle type.
- I. Stem: Metal, for thermowell installation and of length to suit installation.
- J. Range: Conform to the following:
  - 1. Domestic Hot Water: 20°F - 240°F with 2°F scale divisions.
- K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

### 2.3 SOLAR POWERED DIGITAL THERMOMETERS/TRANSMITTERS

- A. General: Provide solar thermometers/transmitters of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
- B. Case: High-impact ABS with 3/8" LCD digital display.
- C. Adjustable Joint: High impact ABS, finished to match case, 180 degree adjustment in vertical plane, 360 degree adjustment in horizontal plane, with locking device.
- D. Stem Assemblies: Stem assemblies shall be 3-1/2", 6", or 9" in length conforming to the following where replacing existing thermometers:
  - 1. Federal Specification GG-T-321D, fully interchangeable with industrial glass thermometers
  - 2. ASME B40.3-1990, fully interchangeable with bimetallic dial thermometers.
- E. Recalibration: Through case potentiometer adjustment.
- F. Thermometer Characteristics:
  - 1. Range: -50 to 300°F/-45 to 150°C, switchable.
  - 2. Accuracy: 1% of reading or 1°F.
  - 3. Resolution: 1/10°F.
  - 4. Lux Rating: 10 Lux (one foot candle).
  - 5. Update Time: 10 seconds.
  - 6. Ambient Operating Temperature: -30 to 140°F.
  - 7. Humidity: 100%.
  - 8. Glass passivated thermistor – NTC.
- G. Transmitter Characteristics:

1. Range: -58 to 302°F.
2. Accuracy: 0.5% of span.
3. Output: 4-20mA.
4. Ambient Operating Temperature: -15 to 185°F.
5. Ambient Error: 0.015% of span.
6. Power Supply: 8.5 to 35VDC
7. Maximum Load Resistance: 77Ω with 24VDC power supply.
8. Sensor: Platinum 100Ω RTD.

#### 2.4 THERMOMETER WELLS

- A. General: Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well.
- B. Manufacturer: Same as thermometers.

#### 2.5 TEMPERATURE GAGE CONNECTOR PLUGS

- A. General: Provide temperature gage connector plugs pressure rated for 500 psi and 200°F. Construct of brass and finish in nickel-plate, equip with 1/2" NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly from dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.

#### 2.6 PRESSURE GAGES

- A. General: Provide pressure gages of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
- B. Type: General use, 1% accuracy, ANSI B 40.1 grade A, phosphor bronze bourdon type, bottom connection.
- C. Case: Drawn steel or brass, glass lens, 4-1/2" diameter bezel with 4 digit, 5/8" LCD digital display.
- D. Connector: Brass with 1/4" male NPT.
- E. Scale: White coated aluminum, with permanently etched markings.
- F. Range: Conform to the following:
  1. Water: 0 - 100 PSI.

#### 2.7 PRESSURE GAGE ISOLATION VALVES

- A. General: Provide ball valves. Refer to Division 22 Sections "General Duty Valves for Plumbing Piping".
- B. Snubber: 1/4" brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.

- C. Manufacturer: Same as for pressure gages.

## 2.8 PRESSURE GAGE CONNECTOR PLUGS

- A. General: Provide pressure gage connector plugs pressure rated for 500 psi and 200°F. Construct of brass and finish in nickel-plate, equip with 1/2" NPT fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly from dial type insertion pressure gage. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.

## 2.9 CALIBRATED BALANCE VALVES

- A. General: Provide as indicated, calibrated balance valves equipped with readout valves to facilitate connecting of differential pressure meter to balance valves. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss during monitoring process. Provide calibrated nameplate to indicated degree of closure of precision machined orifice. Construct balancing valve with internal EPT o-ring seals to prevent leakage around rotating element. Provide balance valves with preformed polyurethane insulation suitable for use on heating and cooling systems, and to protect balance valves during shipment.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine areas and conditions under which meters and gages are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.2 INSTALLATION OF TEMPERATURE GAGES

- A. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by observer standing on floor.
- B. Locations: Install in the following locations, and elsewhere as indicated:
  - 1. At outlet of each domestic hot water heater.
  - 2. At each domestic hot water return on recirculated systems.
- C. Thermometer Wells: Install in piping tee where indicated, in vertical upright position. Fill well with oil or graphite, secure cap.
- D. Temperature Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

### 3.3 INSTALLATION OF PRESSURE GAGES

- A. General: Install pressure gages in piping tee with pressure gage cock, located on pipe at most readable position.

- B. Locations: Install in the following locations, and elsewhere as indicated:
  - 1. At suction and discharge of each plumbing pump.
  - 2. At discharge of each pressure reducing valve.
  - 3. At water service outlet.
- C. Pressure Gage Cocks: Install in piping tee with snubber.
- D. Pressure Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

### 3.4 CALIBRATED BALANCE VALVES

- A. Calibrated Balance Valves: Install on piping with readout valves in vertical upright position. Maintain minimum length of straight unrestricted piping equivalent to 3 pipe diameters upstream of valve.
- B. Locations: Install in the following locations, and elsewhere as indicated.
  - 1. At discharge of each plumbing pump.

### 3.5 ADJUSTING AND CLEANING

- A. Adjusting: Adjust faces of meters and gages to proper angle for best visibility.
- B. Cleaning: Clean windows of meters and gages and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

**END OF SECTION 22 05 19**



## **SECTION 22 05 23 – GENERAL DUTY VALVES FOR PLUMBING PIPING**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. This Section includes general duty valves common to most plumbing piping systems.
- B. Types of valves specified in this section include the following:
  - 1. Ball
- C. Special purpose valves are specified in individual piping system specifications.
- D. Valves tags and charts are specified in Division-22 Section Basic Plumbing Materials and Methods."

#### **1.2 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract, Division 1 Specifications Sections and Section 22 01 00.
- B. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

#### **1.3 QUALITY ASSURANCE**

- A. American Society of Mechanical Engineers (ASME) Compliances: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- B. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.
- C. All valves and connections shall comply with NSF/ANSI 372 and NSF/ANSI 61. Valves/Connections shall be "lead free"

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- A. Preparation for Transport: Prepare valves for shipping as follows:
  - 1. Ensure valves are dry and internally protected against rust and corrosion.
  - 2. Protect valve ends against damage to threads, flange faces, and weld-end preps.
  - 3. Set valves in best position for handling. Set globe and gate valves closed to prevent rattling; set ball valves open to minimize exposure of functional surfaces; set butterfly valves closed or slightly open; and block swing check valves in either closed or open position.
- B. Storage: Use the following precautions during storage:

1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
  2. Protect valves from weather. Store valves indoor. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valve off the ground or pavement in watertight enclosures.
- C. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels and stems as lifting or rigging points.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturer: Subject to the compliance with requirements, provide valves from one of the manufacturers listed in valve schedule.

### **2.2 VALVE FEATURES, GENERAL**

- A. Valve Design: Rising stem or rising outside screw and yoke stems.
1. Non-rising stem valves may be used where headroom prevents full extension of rising stems.
- B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. Operators: Provide the following special operator features:
1. Handwheels, fastened to valve stem, for valves other than quarter turn.
  2. Lever Handles, on quarter-turn valves 6 inches and smaller.
  3. Chain-wheel operators for valves 2-1/2 inches and larger, installed 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
  4. Gear drive operators on quarter-turn valves 8 inches and larger.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stem arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. End Connections: As indicated in the valve specifications.
1. Threads: Comply with ANSI B1.20.1.
  2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
  3. Solder-Joint: Comply with ANSI B16.18.

- a. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg. F for gate, globe, and check valves; below 421 deg. F for ball valves.

### 2.3 BALL VALVES

#### A. Manufacturers:

1. Apollo
2. Nibco
3. Watts

B. Ball valves - 1 Inch and Smaller: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B 62, standard (or regular) port, stainless steel ball, replaceable "Teflon" or "TFE" seats and seals, stainless steel blowout proof stem, and vinyl-covered steel handle. Provide threaded ends for domestic hot and cold water service.

C. Ball Valves - 1-1/4 Inch to 3 Inch: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; 3-piece construction; with bronze body conforming to ASTM B 62, conventional port, stainless steel ball, replaceable "Teflon" or "TFE" seats and seals, stainless steel blowout proof stem, and vinyl-covered steel handle. Provide threaded ends for domestic hot and cold water service.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine valve interior through the end ports, for cleanliness, freedom from foreign matter and corrosion. Remove special packing materials, such as blocks used which prevents disc movement during shipping and handling.
- B. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such action. Following examination, return the valve closure member to the shipping position.
- C. Examine threads on both the valve and the mating pipe for form (i.e., out-of-round or local indentation) and cleanliness.
- D. Examine mating flange faces for conditions which might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and for freedom from defects and damage.
- E. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.
- F. Replace defective valves with new valves.

### 3.2 VALVE SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size 2 Inches and Smaller: Threaded ends.
2. Steel Pipe Sizes 2 Inches and Smaller: Threaded ends.
3. Steel Pipe Sizes 2-1/2 Inches and Larger: Flanged ends.

### 3.3 VALVE INSTALLATIONS

- A. General Application: Use gate, ball, and butterfly valves for shut-off duty; globe, ball, and butterfly for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.
- B. Use gate valves only where required to make hot-taps into existing piping system or as indicated.
- C. Provide memory stops for all valves used for throttling service.
- D. Locate valves for easy access and provide separate support where necessary.
- E. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shut-down. Unions are not required on flanged devices.
- F. Install valves in horizontal piping with stem at or above the center of the pipe.
- G. Install valves in a position to allow full stem movement.

### 3.4 SOLDER CONNECTIONS

- A. Cut tube square and to exact lengths.
- B. Clean end of tube to depth of valve socket, using steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.
- C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.
- D. Open gate and globe valves to fully open position.
- E. Remove the cap and disc holder of swing check valves having composition discs.
- F. Insert tube into valve socket making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to insure even distribution of the flux.
- G. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating the valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

### 3.5 THREADED CONNECTIONS

- A. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
- B. Align threads at point of assembly.

- C. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).
- D. Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.6 FLANGED CONNECTIONS

- A. Align flanges surfaces parallel.
- B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using a torque wrench.
- C. For dead end service, butterfly valves required flanges both upstream and downstream for proper shutoff and retention.

3.7 FIELD QUALITY CONTROL

- A. Tests: After piping system have been tested and put into service, but before final adjusting and balancing, inspect valve for leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.

3.8 ADJUSTING AND CLEANING

- A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive finish painting or insulation.

3.9 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

VALVES - 2 INCHES AND SMALLER				
SERVICE			BALL	CHECK
Domestic Hot and Cold Water			150	125

VALVES - 2-1/2 INCHES AND LARGER				
SERVICE			BALL	CHECK
Domestic Hot and Cold Water			200	125

3.10 VALVE SCHEDULE

- A. Provide lead free version of models in valve schedules
- B.

BALL VALVES - 1 INCH AND SMALLER		
MANUFACTURER	THREADED ENDS	SOLDER ENDS
Conbraco (Apollo)	77CLF140	77CLF240
Jomar	T-100N	S-100N
Nibco	T-585-70-66	S-585-70-66

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Watts	B-6080	B-6081
REMARKS: X – Means not available.		

C.

BALL VALVES – 1-1/4 INCH AND LARGER		
MANUFACTURER	THREADED ENDS	SOLDER ENDS
Conbraco (Apollo)	82-100	82-200
Jomar	T-600-4B	S-600-4B
Nibco	T-590-Y	S-590-Y
Watts	B-6800	B-6801
REMARKS: X – Means not available.		

**END OF SECTION 22 05 23**

## **SECTION 22 07 00 - PLUMBING INSULATION**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Extent of plumbing insulation required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. This section includes pipe and equipment insulation.

#### **1.2 DEFINITIONS**

- A. Hot Surfaces: Normal operating temperatures of 100°F or higher.
- B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
- C. Cold Surfaces: Normal operating temperatures less than 75°F.
- D. Thermal Resistivity: "r-values" represent the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in °F between two exposed faces required to cause one Btu to flow through one square foot of material, in one hour, at a given mean temperature.
- E. Density: Is expressed in lb/sq.ft.

#### **1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of plumbing insulation.
- B. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each plumbing system requiring insulation.

#### **1.4 QUALITY ASSURANCE**

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
  - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping and duct systems.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Glass Fiber:
    - a. CertainTeed Corporation.
    - b. Knauf Fiberglass GmbH.
    - c. Manville.
    - d. Owens-Corning Fiberglas Corporation.
    - e. USG Interiors, Inc. - Thermafiber Division.
  - 2. Flexible Elastomeric Cellular:
    - a. Aerocel by Aeroflex.
    - b. Armstrong World Industries, Inc.
    - c. Halstead Industrial Products.
    - d. IMCOA.
    - e. Rubatex Corporation.

#### 2.2 GLASS FIBER

- A. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All-purpose, factory-applied, laminated glass-fiber- reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.
- C. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.
  - 1. Thermal Conductivity: 0.24 average maximum, at 75°F mean temperature.
  - 2. Maximum Temperature Use: 400°F.
- D. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
  - 1. Thermal Conductivity: 0.23 average maximum at 75°F mean temperature.
  - 2. Density: 10 average maximum.
- E. Adhesive: Produced under the UL Classification and Follow-up service.



1. Type: Non-flammable, solvent-based.
2. Service Temperature Range: Minus 20 to 180°F.

F. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

### 2.3 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: EPDM rubber based with flexible expanded closed-cell structure with smooth skin on both sides.

1. Tubular Materials: ASTM C 534, Type I.
2. Sheet Materials: ASTM C 534, Type II.

B. Thermal Conductivity: 0.245 average maximum at 75°F.

C. Vapor Transmission Rate: 0.03 Perms.

D. Sealing System: Self sealing with protape.

E. Temperature Use Range: -250°F to +250°F.

F. Flame Spread/Smoke Developed Rating: 25/50 up to 2-inches in thickness.

### 2.4 INSULATING CEMENTS

A. Mineral Fiber: ASTM C 195.

1. Thermal Conductivity: 1.0 average maximum at 500°F mean temperature.
2. Compressive Strength: 10 psi at 5 percent deformation.
3. Temperature Use Range: 100°F to 1600°F.

B. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.

1. Thermal Conductivity: 1.2 average maximum at 400°F mean temperature.
2. Compressive Strength: 100 psi at 5 percent deformation.
3. Temperature Use Range: 100°F to 1200°F.

### 2.5 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:

1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

### 2.6 FIELD APPLIED JACKETS

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- A. General: ASTM C 921, Type 1, except as otherwise indicated for field applied jackets.
- B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
  - 1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.
  - 2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.
- C. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20-mils thick, roll stock ready for shop or field cutting and forming to indicated sizes.
  - 1. Adhesive: As recommended by insulation manufacturer.
- D. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultra-violet-resistant PVC.
  - 1. Adhesive: As recommended by insulation manufacturer.

2.7 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per sq. yd.
  - 1. Tape Width: 4 inches.
  - 2. Cloth Standard: MIL-C-20079H, Type I.
  - 3. Tape Standard: MIL-C-20079H, Type II.
- B. Bands: 3/4-inch wide, in one of the following materials compatible with jacket:
  - 1. Stainless Steel: Type 304, 0.020 inch thick.
  - 2. Galvanized Steel: 0.005 inch thick.
  - 3. Aluminum: 0.007 inch thick.
  - 4. Brass: 0.01 inch thick.
  - 5. Nickel-Copper Alloy: 0.005 inch thick.
- C. Wire: 14-gage nickel copper alloy, 16-gage, soft-annealed stainless steel, or 16-gage, soft-annealed galvanized steel.
- D. Corner Angles: 28-gage, 1-inch by 1-inch aluminum, adhered to 2-inch by 2-inch kraft paper.
- E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.8 SEALING COMPOUNDS

- A. Vapor Barrier Compound: Water-based, fire-resistive composition.
  - 1. Water Vapor Permeance: 0.08 perm maximum.
  - 2. Temperature Range: Minus 20 to 180°F.
- B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.

1. Water Vapor Permeance: 0.02 perm maximum.
2. Temperature Range: Minus 50 to 250°F.
3. Color: Aluminum.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.
- B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.
  1. Follow cement manufacturer's printed instructions for mixing and portions.

#### **3.2 INSTALLATION, GENERAL**

- A. Refer to schedules on the drawings for materials, forms, jackets, and thicknesses required for each plumbing system.
- B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60°F.
- D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- E. Install insulation with smooth, straight, and even surfaces.
- F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.
- G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
- H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.
- I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.
- J. Keep insulation materials dry during application and finishing.
- K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
  1. Flexible connectors for pipes.
  2. Vibration control devices.

3. Testing laboratory labels and stamps.
4. Nameplates and data plates.
5. Fire protection piping systems.
6. Sanitary drainage and vent piping.
7. Drainage piping located in crawl spaces, unless indicated otherwise.
8. Below grade piping.
9. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.
10. Piping specialties including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

### 3.3 PIPE INSULATION INSTALLATION, GENERAL

- A. Tightly butt longitudinal seams and end joints. Bond with adhesive.
- B. Stagger joints on double layers of insulation.
- C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.
- D. Apply insulation with a minimum number of joints.
- E. Apply insulation with integral jackets as follows:
  1. Pull jacket tight and smooth.
  2. Cover circumferential joints with butt strips, at least 3-inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.
  3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
    - a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35°F.
  4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
  5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
  6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.
- F. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer. Refer to Division [7 Section "Joint Sealants"] [22 Section "Basic Plumbing Materials and Methods"].
- G. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer. Refer to Division [7 Section "Joint

Sealants”][22 Section “Basic Plumbing Materials and Methods] for firestopping and fire-resistant joint sealers.

- H. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.
- I. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
  - 1. Use same material and thickness as adjacent pipe insulation.
  - 2. Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.
  - 3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
  - 4. Insulate elbows and tees smaller than 3-inches pipe size with premolded insulation.
  - 5. Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.
  - 6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
- J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 22 Section "Hangers and Supports For Plumbing Piping and Equipment." For cold surface piping, extend insulation on anchor legs a minimum of 12 inches and taper and seal insulation ends.
  - 1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

### 3.4 GLASS FIBER PIPE INSULATION INSTALLATION

- A. Bond insulation to pipe with lagging adhesive.
- B. Seal exposed ends with lagging adhesive.
- C. Seal seams and joints with vapor barrier compound.

### 3.5 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
  - 1. Miter cut materials to cover soldered elbows and tees.
  - 2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

### 3.6 FIELD APPLIED JACKETS

- A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2-inch laps at longitudinal joints and 3-inch-wide butt strips at end joints.
  - 1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
- B. Install the PVC jacket with 1-inch overlap at longitudinal and butt joints and seal with adhesive.
- C. Install glass cloth jacket directly over insulation. On insulation with a factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2-inch overlap at joints. Embed glass cloth between (2) 1/16-inch-thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.

### 3.7 FINISHES

- A. Paint finished insulation as specified in Division 9 Section "Painting."
- B. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

### 3.8 APPLICATIONS

- A. General: Materials and thicknesses are specified in schedules [at the end of this Section][on the drawings].
- B. Interior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
  - 1. Domestic cold water.
  - 2. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
  - 3. Domestic hot water.
  - 4. Recirculated hot water.
- C. Interior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
  - 1. Domestic cold water.
  - 2. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
  - 3. Domestic hot water.
  - 4. Recirculated hot water.
- D. Equipment: Unless otherwise indicated, insulate the following indoor equipment:
  - 1. Domestic cold water equipment, tanks, and pumps.
  - 2. Domestic hot water equipment, tanks, and water heaters..

### 3.9 EXISTING INSULATION REPAIR

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- A. Repair damaged sections of existing plumbing insulation, where damaged or removed for new connections. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

3.10 PROTECTION AND REPLACEMENT

- A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

**END OF SECTION 22 07 00**

## **SECTION 22 11 16 – DOMESTIC WATER PIPING**

### **PART 1 - GENERAL**

#### 1.1 WORK INCLUDED

- A. This section specifies the water distribution piping system, including potable cold, hot, and recirculated hot water piping, fittings, and specialties within the building to a point 5 feet outside the building.
- B. Requirements of the following Division 22 Sections apply to this section:
  - 1. Plumbing General Provisions
  - 2. Basic Plumbing Materials and Methods.
  - 3. General Duty Valves For Plumbing Piping.
- C. Related Sections: The following Sections contain requirements that relate to this section.
  - 1. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, flow meters, and pressure gages.
  - 2. Division 22 Section "Basic Plumbing Materials and Methods" for labeling and identification of piping system.

#### 1.2 DEFINITIONS

- A. Water Distribution Piping: A pipe within the building or on the premises which conveys water from the water service pipe or meter to the points of usage.
- B. Water Service Piping: The pipe from the water main or other source of potable water supply to the water distributing system of the building served.
- C. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

#### 1.3 SUBMITTALS

- A. Product Data for each piping specialty and valve specified.
- B. Maintenance Data for each piping specialty and valve specified for inclusion in Maintenance Manual specified in Division 1 and Division 22 Section "Plumbing General Provisions".
- C. Welders Certificates certifying that welders comply with requirements specified in Quality Assurance below.
- D. Certification of Compliance with ASME and UL fabrication requirements specified below.
- E. Test reports specified in Part 3 of this Section.

#### 1.4 QUALITY ASSURANCE



- A. Regulatory Requirements: Comply with the provisions of the following:
1. ASME B 31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.
  2. ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification" for Qualifications for Welding Processes and Operators.
  3. Local, City, and State Plumbing Codes.
  4. All valves and specialties shall be lead free.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store pipe in a manner to prevent sagging and bending.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of pipe sleeves for foundation wall penetrations.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide water products from one of the following:
1. Balance Cocks:
    - a. American Air Filter Co.
    - b. Bell & Gossett ITT; Fluid Handling Div.
    - c. Hammond Valve Corp.
    - d. Milwaukee Valve Co., Inc.
    - e. Spirax Sarco.
    - f. Taco, Inc.
  2. Mixing Valves:
    - a. Leonard Valve Company.
    - b. Mark Controls Corp.; Powers Process Controls.
    - c. Symmons Industries, Inc.
  3. Dielectric Waterway Fittings:
    - a. Victaulic Company of America
    - b. Perfection Corp.
    - c. Watts Regulator Co.
  4. Y-Pattern Strainers:
    - a. Armstrong Machine works.
    - b. Hoffman Specialty ITT; Fluid Handling Div.
    - c. Metraflex Co.
    - d. Spirax Sarco.

- e. Trane Co.
- f. Victaulic Co. of America. (low pressure applications only)
- g. Watts Regulator Co.

## 2.2 PIPE AND TUBE MATERIALS

- A. General: Refer to Part 3, Article "PIPE APPLICATIONS" for identification of systems where the below materials are used.
- B. Annealed Temper Copper Tubing: ASTM B88, Type L
- C. Steel Pipe: ASTM A53, schedule 40, seamless, galvanized, plain ends.
- D. Ductile Iron Pipe: ANSI A21.51 ductile iron pipe, with ANSI A21.4 cement-mortar lining.

## 2.3 FITTINGS

- A. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.
- B. Cast Bronze Flanges: ANSI B16.24, Class 150; raised ground face, bolt holes spot faced.
- C. Unions: ANSI B16.39, malleable iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends. Threads shall conform to ANSI B1.20.1.
- D. Flexible Connectors: Stainless steel bellows with woven flexible bronze wire reinforcing protective jacket; minimum 150 psig working pressure, maximum 250°F operating temperature. Connectors shall have flanged or threaded end connections to match equipment connected; and shall be capable of 3/4 inch misalignment.

## 2.4 JOINING MATERIALS

- A. Solder Filler Metals: ASTM B 32, 95-5 Tin-Antimony.
- B. Gasket Material: Thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures.

## 2.5 GENERAL DUTY VALVES

- A. General duty valves (i.e., check and ball valves,) are specified in Division 22 Section "General Duty Valves For Plumbing Piping." Special duty valves are specified below by their generic name; refer to part 3 Article "VALVE APPLICATION" for specific uses and applications for each valve specified.

## 2.6 SPECIAL DUTY VALVES

- A. Balance Cocks: Class 125, bronze body, bronze plug, screwdriver operated, straight or angle pattern, with soldered end connections.

## 2.7 WATER MIXING VALVES

- A. General: A mixing valve station shall be provided with all specified appurtenances prepiped and provided by the mixing valve manufacturer.
- B. General: ASSE 1017, manually adjustable, thermostatic water mixing valve with bronze body. Include check stop and union on hot- and cold-water-supply inlets, adjustable temperature setting, and thermometer. All valves and appurtenances shall be lead free.
  - 1. Type: Bimetal thermostat, operation and pressure rating 125 psig (860 kPa) minimum.
- C. Manifolder, Thermostatic Water Mixing-Valve Assemblies: Factory-fabricated unit consisting of Hi-low arrangement of thermostatic water mixing valves.
  - 1. Arrangement: One large-flow, thermostatic water mixing valve with flow-control valve, pressure regulator, inlet and outlet pressure gages, and one small-flow, thermostatic water mixing valve with flow-control valve. Include outlet thermometer, factory- or field-installed inlet and outlet valves, and other indicated options.
  - 2. Include piping, valves, and unions.
  - 3. Piping Component Finish: Rough bronze

## 2.8 PIPING SPECIALTIES

- A. Water Hammer Arresters: Bellows type, with stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI standard WH-201.
- B. Relief Valves: Provide proper size for relief valve, in accordance with ASME Boiler and Pressure Vessel Codes, for indicated capacity of the appliance for which installed.
  - 1. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210°F, and pressure relief at 150 psi.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify all dimensions by field measurements. Verify that all water distribution piping may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.
- B. Examine rough-in requirements for plumbing fixtures and other equipment having water connections to verify actual locations of piping connections prior to installation.
- C. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 PIPE APPLICATIONS

- A. General: All piping shall be Made in the USA

- B. Install Type L, annealed temper copper tubing with wrought copper fittings and solder joints for 4 inch and smaller, above ground, within building.

### 3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
- B. Use fittings for all changes in direction and all branch connections.
- C. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
- D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1 inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- G. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.
- H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4 inch ball valve, and short 3/4 inch threaded nipple and cap.
- I. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division [7][22] Section “[Joint Sealers][Basic Plumbing Materials and Methods]” for special sealers and materials.
- J. Install piping with 1/32 inch per foot (1/4 percent) downward slope towards drain point.

### 3.4 HANGERS AND SUPPORTS

- A. Conform to the table below for maximum spacing of supports. Hangers and supports shall comply with MSS SP-58
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.
  - 2. Adjustable roller hangers and spring hangers for individual horizontal runs 20 feet and longer.
  - 3. Pipe roller, complete-MSS Type 44 for multiple horizontal runs, 20 feet or longer, support on a trapeze.
  - 4. Spring hangers to support vertical runs.
- C. Install hangers with the following minimum rod sizes and maximum spacing:

<u>Nom. Pipe Size</u>	<u>Max. Span-Ft.</u>	<u>Min. Rod Size-Inches</u>
1/2	6	3/8
3/4	6	3/8
1	6	3/8
1-1/2	9	3/8
2	10	3/8
3	12	1/2
3-1/2	13	1/2
4	14	5/8
5	16	5/8
6	17	3/4
8	19	7/8
10	22	7/8
12	23	7/8

- D. Support vertical runs at each floor.

### 3.5 PIPE AND TUBE JOINT CONSTRUCTION

- A. Soldered joints: Comply with the procedures contained in the AWS "Soldering Manual."
1. CAUTION: Remove stems, seats, and packing of valves and accessible internal parts of piping specialties before soldering.
  2. Fill the tubing and fittings during soldering with an inert gas (nitrogen or carbon dioxide) to prevent formation of scale.
  3. Heat joints to proper and uniform temperature.
- B. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe fittings and valves as follows:
1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
  2. Align threads at point of assembly.
  3. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).
  4. Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.
    - a. Damaged Threads: Do not use pipe with threads which are corroded or damaged. If a weld opens during cutting or threading operations, that portions of pipe shall not be used.
- C. Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

### 3.6 VALVE APPLICATIONS

- A. General Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:
1. Shut-Off Duty: Use ball valves.
  2. Throttling Duty: Use ball valves.

### 3.7 INSTALLATION OF VALVES

- A. Sectional Valves: Install sectional valves on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as indicated. For sectional valves 2" and smaller, use ball valves; for sectional valves 2-1/2" and larger, use butterfly valves.
- B. Shutoff Valves: Install shutoff valves on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated. For shutoff valves 2" and smaller, use ball valves; for shutoff valves 2-1/2" and larger, use butterfly valves.
- C. Drain Valves: Install drain valves on each plumbing equipment item, located to completely drain equipment for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to completely drain distribution piping system. For drain valves 2" and smaller, use ball valves; for drain valves 2-1/2" and larger, use butterfly valves.
- D. Check Valves: Install swing check valves on discharge side of each pump, and elsewhere as indicated.
- E. Balance Cocks: Install in each hot water recirculating loop, discharge side of each pump, and elsewhere as indicated.

### 3.8 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Local, City or State Plumbing Code.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated. Provide shutoff valve and union for each connection, provide drain valve on drain connection. For connections 2-1/2" and larger, use flanges instead of unions.

### 3.9 FIELD QUALITY CONTROL

- A. Inspections: Inspect water distribution piping as follows:
  - 1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
  - 2. During the progress of the installation, notify the plumbing official having jurisdiction, at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
    - a. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
    - b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.
    - c. Additive Alternate #5: Eliminate lavatory insulation.
  - 3. Reinspections: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections and arrange for reinspection by the plumbing official.
  - 4. Reports: Prepare inspection reports, signed by the plumbing official.
- B. Test water distribution piping as follows:

1. Test for leaks and defects on all new water distribution piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
2. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.
3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to stand for a period of 4 hours. Leaks and loss in test pressure constitute defects which must be repaired.
4. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
5. Prepare reports for all tests and required corrective action.

### 3.10 ADJUSTING AND CLEANING

#### A. Cleaning and Disinfect water distribution piping as follows::

1. Purge all new water distribution piping systems and parts of existing systems, which have been altered, extended, or repaired prior to use.
2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction, or in case a method is not prescribed by that authority, the procedure described in either AWWA C601, or AWWA D105, or as described below:
  - a. Flush the piping system with clean, potable water until dirty water does not appear at the points of outlet.
  - b. Fill the system or part thereof, with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system, or part thereof, and allow to stand for 24 hours.
  - c. Drain the system, or part thereof, of the previous solution, and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
  - d. Following the allowed standing time, flush the system with clean potable water until chlorine does not remain in the water coming from the system.
  - e. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

#### B. Prepare reports for all purging and disinfecting activities.

### 3.11 COMMISSIONING

#### A. Fill the system.

#### B. Before operating the system perform these steps:

1. Open valves to full open position. Close drain, valves, hydrants, and still cocks.
2. Remove and clean strainers.
3. Check pump for proper direction of rotation. Correct improper wiring.
4. Lubricate pump motors and bearings.

**END OF SECTION 22 11 16**



## **SECTION 22 14 29 – PLUMBING PUMPS**

### **PART 1 - GENERAL**

#### 1.1 WORK INCLUDED

- A. Extent of plumbing pumps work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of pumps specified in this section include the following:
  - 1. Inline circulators.
- C. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Division 26 Section "General Electrical" for power-supply wiring including field-installed disconnects and required electrical devices.

#### 1.2 SUBMITTALS

- A. General: Submit the following in accordance with conditions of contract, Division 1 Specification, and Section 22 01 00 Section.
- B. Product Data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories, plus installation and start-up instructions.
- C. Shop Drawings showing layout and connections for plumbing pumps. Include setting drawings with templates, and directions for installation of foundation bolts, anchor bolts, and other anchorages.
- D. Wiring Diagrams detailing wiring for power, signal, and control systems; differentiating between manufacturer-installed wiring and factory-installed wiring.
- E. Maintenance Data for plumbing pumps, for inclusion in Operating and Maintenance Manuals specified in Division 1 and Division 22 Section "Plumbing General Provisions."

#### 1.3 QUALITY ASSURANCE

- A. Hydraulic Institute Compliance: Design, manufacture, and install plumbing pumps in accordance with "Hydraulic Institute Standards."
- B. National Electrical Code Compliance: Components shall comply with NFPA 70 "National Electrical Code."
- C. UL Compliance: Plumbing pumps shall be listed and labeled by UL and comply UL Standard 778 "Motor Operated Water Pumps."
- D. NEMA Compliance: Electric motors and components shall be listed and labeled NEMA.

- E. SSPMA Compliance: Test and rate sump and sewage pumps in accordance with the Sump and Sewage Pump Manufacturers Association (SSPMA) Standards.
- F. Design Criteria: The Drawings indicate sizes, profiles, connections, and dimensional requirements of plumbing pumps and are based on the specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered, provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Architect/Engineer. The burden of proof for equality of plumbing pumps is on the proposer.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store pumps in a dry location.
- B. Retain shipping flange protective covers and protective coatings during storage.
- C. Protect bearings and couplings against damage from sand, grit, and other foreign matter.
- D. For extended storage times (greater than 5 days), dry internal parts with hot air or a vacuum-producing device. After drying, coat internal parts with light oil, kerosene, or antifreeze. Dismantle bearings and couplings, dry and coat with an acid-free, heavy oil, and tag and store in dry location.
- E. Comply with manufacturer's rigging instructions for handling.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Inline Circulators:
    - a. Taco, Inc. (model 0034e)
    - b. Amtrol, Inc.
    - c. Armstrong Pumps, Inc.
    - d. Bell & Gossett, ITT.

#### 2.2 PUMPS, GENERAL

- A. Pumps and Circulators: Factory assembled and factory tested.
- B. Preparation for shipping: After assembly and testing, clean flanges and exposed machined metal surfaces and treat with an anticorrosion compound. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.
- C. Motors: Conform to NEMA Standards; single, multiple, or variable speed with type of enclosure and electrical characteristics as indicated; have built-in thermal-overload protection and grease-lubricated ball bearings. Select motors that are nonoverloading within the full range of the pump performance curve.

- D. Apply factory finish paint to assembled, tested units prior to shipping.

### 2.3 INLINE CIRCULATORS

- A. General Description: Circulators shall be horizontal inline, centrifugal, wet-rotor, stainless steel, with mechanical seals, and rated for 125 psig working pressure and 225 degree. F continuous water temperature. Rated potable water systems.
- B. Casings: Bronze, with threaded companion flanges for piping connections smaller than 2-1/2 inches, and threaded gage tappings at inlet and outlet connections.
- C. Impeller: Statically and dynamically balanced, closed, overhung, single suction, fabricated from Rolled Temper brass conforming to ASTM B 36, and keyed to shaft.
- D. Motors: EC Motor for speed control, and balancing
- E. Controls: Motor must be able to be controlled by an aquastat and time clock.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine areas, equipment foundations, and conditions with Installer present, for compliance with requirements for installation and other conditions affecting performance of plumbing pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Comply with the manufacturer's written installation and alignment instructions.
- B. Install pumps in locations and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.
- C. Support pumps and piping separately so that the weight of the piping system does not rest on the pump.
- D. Suspend inline pumps with allthread hanger rod and vibration isolation hangers of sufficient size to support the weight of the pump independent from the piping system.
- E. General: Install valves that are same size as the piping connecting the pump.
- F. Install suction and discharge pipe sizes equal to or greater than the diameter of the pump nozzles.
- G. Install a nonslam check valve and ball valve on the discharge side of pumps.
- H. Install a ball valve and strainer on the suction side of inline pumps.
- I. Install pressure gage connector plugs in suction and discharge piping around pump. Pressure gage connector plugs are specified in Division 22 Section "Meters and Gages."

- J. Electrical wiring and connections are specified in Division 26 sections.
- K. Control wiring and connections are specified in other Division 22 sections.

### 3.3 FIELD QUALITY CONTROL

- A. Check suction lines connections for tightness to avoid drawing air into the pump.

### 3.4 COMMISSIONING

- A. Final Checks Before Start-Up: Perform the following preventative maintenance operations and checks before start-up:
  - 1. Lubricate oil-lubricated bearings.
  - 2. Remove grease-lubricated bearing covers and flush the bearings with kerosene and thoroughly clean. Fill with new lubricant in accordance with the manufacturer's recommendations.
  - 3. Disconnect coupling and check motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.
  - 4. Check that pump is free to rotate by hand. For pumps handling hot liquids, pump shall be free to rotate with the pump hot and cold. If the pump is bound or even drags slightly, do not operate the pump until the cause of the trouble is determined and corrected.
- B. Starting procedure for pumps with shutoff power not exceeding the safe motor power"
  - 1. Prime the pump, opening the suction valve, closing the drains, and prepare the pump for operation.
  - 2. Open the valve in the cooling water supply to the bearings where applicable.
  - 3. Open the cooling water supply valve if the stuffing boxes are water cooled.
  - 4. Open the sealing liquid supply valve if the pump is so fitted.
  - 5. Open the warm-up valve of a pump handling hot liquids if the pump is not normally kept at operating temperature.
  - 6. Open the recirculating line valve if the pump should not be operated against dead shutoff.
  - 7. Start motor.
  - 8. Open the discharge valve slowly.
  - 9. Observe the leakage from the stuffing boxes and adjust the sealing liquid valve for proper flow to ensure the lubrication of the packing. Do not tighten the gland immediately, but let the packing run in before reducing the leakage through the stuffing boxes.
  - 10. Check the general mechanical operation of the pump and motor.
  - 11. Close the recirculating line valve once there is sufficient flow through the pump to prevent overheating.
- C. If the pump is to be started against a closed check valve with the discharge ball valve open, the steps are the same except that the discharge ball valve is opened some time before the motor is started.

**END OF SECTION 22 14 29**

## **SECTION 22 33 00 – PLUMBING EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Extent of plumbing equipment work is indicated on drawings and provisions of this section, including schedules and equipment lists associated with either drawings or this section.
- B. Types of plumbing equipment required for project include the following:
  - 1. Domestic water heaters.
    - a. Commercial high efficiency condensing gas-fired water heaters
  - 2. Domestic hot water expansion tanks.
- C. Refer to other division-22 sections for water piping, specialties, pumps, fuel piping, automatic temperature controls, and breechings which are required external to plumbing equipment for installation.

#### **1.2 QUALITY ASSURANCE**

- A. Manufacturers: Firms regularly engaged in manufacture of plumbing equipment of type and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
  - 1. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.
  - 2. NFPA Compliance: Install gas-fired water heaters in accordance with requirements of NFPA, "National Fuel Gas Code".
  - 3. ASHRAE Compliance: Provide water heaters with performance efficiencies not less than prescribed in ASHRAE 90A, "Energy Conservation in new Building Design".
  - 4. NEC Compliance: Comply with National Electrical Code (ANSI/NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.
  - 5. ANSI Compliance: Comply with ANSI Z223.1 (NFPA 54) "National Fuel Gas Code", as applicable to installation of gas-fired water heaters.
  - 6. AGA and NSF Labels: Provide water heaters which have been listed and labeled by American Gas Association and National Sanitation Foundation.
  - 7. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME Code symbol:
    - a. Commercial water heaters.
  - 8. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.

9. Mineral Standards: Provide mineral products for water softeners, acceptable under state and local public health control regulations.
10. AWWA Compliance: Comply with applicable American Water Works Association standards pertaining to steel water tanks.
11. PDI Compliance: Test and rate grease interceptors in accordance with PDI Standard G101, "Testing and Rating Procedure for Grease Interceptors".

### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's plumbing equipment specifications installation and start-up instructions, and capacity and ratings, with selection points clearly indicated.
- B. Shop Drawings: Submit assembly type shop drawings indicated dimensions, weights, required clearances, and methods of assembly of all components.
- C. Wiring Diagrams: Submit ladder-type wiring diagrams for all components, clearly indicating all required field electrical connections.
- D. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in maintenance manual, in accordance with requirements of Section 22 00 00.

### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Handle plumbing equipment and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged water heaters or components; remove from site and replace with new.
- B. Store plumbing equipment and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with manufacturer's rigging and installation instructions for unloading plumbing equipment, and moving units to final location for installation.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Commercial High Efficiency Condensing Gas-fired Water Heaters:
    - a. Lockinvar Water Heater Corp.
    - b. PVI Industries, Inc.
    - c. Rheem Water Heater Div; City Investing Co.
  2. Domestic Hot Water Expansion Tanks:
    - a. Wessels NL series.
    - b. Amtrol

## 2.2 DOMESTIC WATER HEATERS

### A. Commercial High Efficiency Condensing Gas-Fired Water Heaters:

1. General: Provide commercial gas-fired water heaters of size and capacity as indicated on schedule. Provide certification of design by AGA under Volume III tests for commercial water heaters for delivery of 160°F water.
2. Type: High efficiency condensing type with sealed combustion system for direct venting.
3. Tank: ASME construction for a working pressure of 150 PSI; 3/4" tapping for relief valve, and 1" or 1-1/2" inlet and outlet water connections.
4. Insulation: Water heater tank shall be insulated with 2" of insulation (R-14.2) on the sides and 3" of insulation (R21.3) on top. Insulation shall be non-CFC polyurethane foam.
5. Heat exchanger: Construct of stainless steel.
6. Burner: Forced draft type gas valve, with hot surface ignitor, flame probe, and vent high temperature reset switch.
7. Operating Controls: Self diagnostic solid state electronic temperature and ignition control panel with LED fault display and digital readout for water temperature, set point, and differential.
  - a. Automatic Ignition: ANSI Z21.20, automatic gas-ignition system and components.
8. Safety Controls: Equip with automatic gas shutoff device to shut off entire gas supply in event of excessive temperature in tank; and pilot safety shutoff.
9. Provide gas pressure regulator; pilot gas regulator; thermostat; and temperature limit control.
10. Accessories: Provide 3/4" brass drain valve; 3/4" AGA/ASME rated pressure and temperature relief valve, and manufacturer's recommended concentric vent kit.
11. Clearance Requirements: Zero clearance to all combustible materials. Provide 24" service clearance in front of control panel.
12. ASME Stamp: Water heaters of 200,000 BTUH input and 120 gallon storage and above, shall be ASME constructed and provided with ASME stamp, unless local code allows otherwise.
13. Warranty: Furnish 3 year limited warranty for tank leakage.
14. Basis of Design: Lochinvar "Shield".
15. Provide BACnet gateway for connection to BAS.

## 2.3 EXPANSION TANKS

- A. Carbon steel shell construction, ASME coded tank designed for 150PSIG pressure with pre-charged air chamber with NFP compliant heavy duty butyl diaphragm and epitaxial liner for complete non-ferris water reservoir. Expansion tanks shall be FDA approved and shall have a stainless steel water connection. Expansion tank size shall be as indicated on the "Domestic Hot Water Expansion Tank Schedule" on the plumbing drawings.
- B. Tank shall follow ASHRAE 188 Anti-Legionella guidelines.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine areas and conditions under which plumbing equipment is installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.2 INSTALLATION OF DOMESTIC WATER HEATERS

- A. High Efficiency Condensing Gas-Fired Water Heaters:
  - 1. General: Install gas-fired water heaters as indicated, in accordance with manufacturer's installation instructions, and in compliance with applicable codes.
  - 2. Support: Set units on concrete pads, orient so controls and devices needing service and maintenance have adequate access. Level and plumb unit.
  - 3. Gas Supply: Connect gas supply to gas line with drip leg, tee, gas cock, and union; full size of unit inlet connection. Locate piping so as not to interfere with service of unit.
  - 4. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve, check valve, and union. Extend relief valve discharge to closest floor drain, or as indicated.
  - 5. Flue: Install direct vent and combustion air piping with concentric vent kit thru roof or exterior wall with vent termination cap as indicated on the drawings.
  - 6. Condensate Drain: Install full size condensate drain from unit to floor drain.
  - 7. Gages: Provide thermometers on inlet and outlet piping.
  - 8. Start-Up: Start-up, test, and adjust gas-fired water heaters in accordance with manufacturer's start-up instructions, and Utility Company's requirements. Check and calibrate controls, adjust burner for maximum efficiency.

### 3.3 CLOSEOUT PROCEDURES

- A. Training: Provide services of manufacturer's technical representative for 1-half day to instruct Owner's personnel in operation and maintenance of plumbing equipment.
  - 1. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

**END OF SECTION 22 33 00**



## **SECTION 23 00 00 - MECHANICAL GENERAL PROVISIONS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. This Section applies to all Division 23 (mechanical) work.
- B. Related Documents: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements applies to all Division 23 work.

#### **1.2 COORDINATION BETWEEN SPECIFICATION SECTIONS**

- A. Each specification section within their respective division shall be coordinated with all other sections in that division for related work.

#### **1.3 COORDINATION OF WORK**

- A. General:
  - 1. Refer to the Division 1 sections for general coordination requirements applicable to the entire work. The contractor shall recognize that the contract documents are diagrammatic in showing certain physical relationships which must be established within the plumbing, mechanical and electrical work, and in its interface with other work including utilities and that such establishment is the exclusive responsibility of the Contractor. Because the drawings are diagrammatic and on a small scale, all rises, drops, offsets, etc., have not been shown. The Contractor shall agree to provide and install the necessary conduit, piping, fittings, valves, ducts, and other specialties to suit such conditions without additional cost to the Owner.
  - 2. Piping and conduits, except electrical conduits run in floor construction, suspended ceiling space, or roof space shall be run parallel with lines of the building unless otherwise noted on drawings. Water supply pipes, where practicable, shall be placed at same elevation and hung on multiple hangers. Electric conduits shall not be hung on hangers with any other service, unless approved by the Engineer and shall be hung above all other service pipes. The different service pipes, valves, fittings, and similar items, shall be so installed that after the covering is applied there will be not less than 1/2" clear space between the finished covering and other work and between the finished covering of parallel adjacent pipes. Hangers on different service lines running close to and parallel with each other shall be in line with each other and parallel to the lines of the building. Exact location of electric outlets, piping, ducts, and the like shall be coordinated to avoid interferences between lighting fixtures, piping, ducts, and similar items.
  - 3. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical and electrical work with adequate access for operation and maintenance.
  - 4. Give right-of-way to piping which must slope for drainage.
  - 5. Advise other trades of openings required in their work for the subsequent move-in of large units of plumbing, mechanical and electrical work (equipment).
  - 6. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Coordination Drawings:

1. For locations where several elements of mechanical (or combined plumbing, mechanical and electrical) work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual physical dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.
2. Install equipment and materials to provide required access for servicing and maintenance.

C. Contract Document Discrepancies:

1. If work is required in manner to make it impossible to produce first class work, or should discrepancies appear among contract documents, request interpretation before proceeding with work. If Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out work in satisfactory manner. Should conflict occur in or between drawings, and specifications, Contractor is deemed to have estimated on more expensive way of doing work unless he shall have asked for and obtained written decision before submission of proposal as to method or materials required.

1.4 FEES, PERMITS, LICENSES, UTILITY CONNECTION CHARGES, AND UTILITY COST.

- A. The Contractor shall obtain and pay for all fees, permits, licenses, utility connection charges (water, sanitary sewer, storm sewer and gas) and utility cost for services to the building required.
- B. The Contractor shall maintain all necessary signal lights, guard against danger and use all proper means for the safety of the public.
- C. The Contractor shall pay for opening and repairing all pavement cuts.
- D. The Contractor shall furnish to the Architect copies of all fees, permits and licenses required for all mechanical work herein specified before any mechanical work is started.

1.5 CONTRACTORS RESPONSIBILITY FOR CONSULTANTS ADDITIONAL SERVICES

- A. The Consultant is entitled to compensation for additional services not included in their contract but provided on this project. Since our contract is with the Owner or Architect, the Owner or Architect has the responsibility to compensate us for these additional services. The Consultant will provide, without advance authorization from the Client, the Additional Services listed below. These services will be tracked in our office and billed to the Client upon completion of the project. The client will in turn deduct the sum of these additional services from the contractor's final payment. The following is a list of services that have been included in our contract with the client along with a description of services that will be charged against the contractor's final payment due to services brought about due to the contractor's actions:
  1. Re-submittals: The consultant has included in their contract with our Client, one (1) review for each submittal item. The contractor is required to carefully review each submittal from their suppliers and subcontractors for compliance with the contract documents along with a written notice of deviations of any type prior to submitting them to the Engineer for review. The Contractor shall be responsible to the Client for all

reasonable costs charged by the Consultant to the Client for the Additional Services required for re-submittals.

2. Substitutions: The Consultant has included in their contract with our Client, incorporation of minor changes to the contract documents to develop record documents in electronic format. These changes are limited to unforeseen site conditions and clarifications to the contract documents. Review of substitutions for compliance with the contract documents, and services required to modify and coordinate changes required due to contractor substitutions or deviations from the contract documents are not included in our contract with the Client. The Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required to modify and coordinate documents or provide field coordination due to contractor substitutions or deviations from the contract documents.
3. Requests For clarification or Interpretation (RFI): The Contractor may, after exercising due diligence to locate required information, request from the Consultant clarification or interpretation of the requirements of the Contract Documents. The Consultant shall, with reasonable promptness, respond to such Contractor's request for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract Documents or is reasonably inferable from them, the Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required to provide such information.
4. Construction Meetings & Site Observations: The consultant has included a predetermined number of construction meetings and site observations in their contract with the owner based on the anticipated construction period specified. However, if additional construction meetings and site observations are required due to the contractors delay in completion of the project, the Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required to attend additional construction meetings or provide additional site observations.
5. Re-inspections: The contractor is responsible to prepare a final punch list for the project and to correct all items prior to calling for a final inspection from the consultant. Upon being notified, the consultant will then visit the site and prepare a final punch list. The contractor is then required to correct all items on the consultant's final punch list and call for a re-inspection of the project. If all items have not been corrected, the final punch list will be updated and additional re-inspections will be required. However, if additional re-inspections are required, the Contractor shall be responsible to the Client for all reasonable costs charged by the Consultant to the Client for the Additional Services required for the additional re-inspections.

#### 1.6 SINGULAR NUMBER

- A. Where any device or part of equipment is herein referred to in the singular number (such as "the pump"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

#### 1.7 CLEANING AND PROTECTION

- A. General: During handling and installation of work at project site, each contractor shall clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

1.8 MAINTENANCE AND OPERATION MANUALS

- A. Prepare and submit four (4) copies of maintenance and operation instructions for all Division 23 and Division 26 equipment furnished. Organize maintenance and operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and indexed (thumb-tabbed). Include emergency instructions, spare parts listing, copies of warranties, wiring diagrams, recommended "turn-around" cycles, inspection procedures, shop drawings, product data, and similar application information. Bind each manual of each set in a heavy-duty 2", 3-ring vinyl-covered binder, and include pocket folders for folded sheet information. Mark identification on both front and spine of each binder.

1.9 PROJECT CLOSE OUT

- A. General: Refer to the Division 1 sections for general closeout requirements. Maintain a daily log of operational data on mechanical equipment and systems through the closeout period; record hours of operation, assigned personnel, fuel consumption and similar information; submit copy to Owner.
- B. Record Drawings: For Division 23 and Division 26 work, give special attention to the complete and accurate recording of underground conduit, piping and ductwork, other concealed and non-accessible work, branching arrangement and valve location for piping systems, locations of dampers and coils in duct systems, locations of control system sensors and other control devices, and work of change orders where not shown accurately by contract documents.
- C. Closeout Equipment/Systems Operations: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operate each item of equipment and each system in a test run of appropriate duration with the Owner's operating personnel present, to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system, and replace dirty filters, excessively worn parts and similar expendable items of the work.
- D. Operating Instructions: Conduct a full-day walk-through instruction seminar for the Owner's personnel to be involved in the continued operation and maintenance of mechanical equipment and systems. Explain the identification system, operational diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency and similar features of the systems.
- E. Turn-Over of Operation: At the time of substantial completion, turn over the prime responsibility for operation of the mechanical equipment and systems to the Owner's operating personnel.

1.10 FINAL COMPLETION

- A. The following special requirements shall be provided in addition to these specifications elsewhere in these specifications:
  - 1. The Division 23 Contractors shall not call for a final completion check until the entire Mechanical and Electrical Equipment and Systems have been installed, adjusted, balanced and in full and complete satisfactory operation and the following certifications of inspection from equipment suppliers have been completed and submitted to the Architect/Engineer. Certifications of Inspections for Division 23 Equipment are required on the following items of equipment:
    - a. Temperature control equipment (Manufacturer)

- B. The Certifications shall consist of letters signed by Factory Trained and Authorized Service Engineers stating the following:
  - 1. They have inspected all of their equipment on the project.
  - 2. They approve the condition of the equipment and its installation.
  - 3. They have fully checked its operation and certify that it is operating properly.
  - 4. They will note any problems, conditions or objections that could lead to future operating problems.
  - 5. Log Sheets shall be provided on start-up of all AHU and Terminal Units and coils serving AHU's. Factory trained representative shall certify log sheets.
  - 6. Units shall be inspected by all concerned and certify the installation and operation of the units and associated heating and cooling equipment. Certification to come from the local rep and the factory.
  
- C. Exceptions may be permitted upon written request from the Contractor listing any minor items that are uncompleted and beyond his reasonable control. The full guarantee that they will be completed at a named later date and the guarantee extended as required to provide a full warranty.

1.11 FINAL PAYMENT

- A. Final Payment will not be made until the Contractor has satisfactorily completed all final inspection items.

1.12 GUARANTEE

- A. The one-year guarantee period shall not start until the project is fully completed and the Contractor has received the Final Payment and Certification of Completion.
- B. All equipment and all work shall be fully guaranteed, parts, and labor, for one full year from the date of the Certificate of Completion. Repairs made during this period must be fully guaranteed for an additional one year period from the date of repairs.
- C. The Division 23 Contractor has the full responsibility to guarantee all equipment and work and shall assume full responsibility to repair any equipment at his cost that the manufacturer refuses to guarantee.
- D. The Owner has the right to order repairs to any equipment or work provided hereon and to charge the Contractor for same if repairs are not made by the Contractor within a reasonable period of time not to exceed 24 hours during an emergency or 72 hours on a non-critical item.
- E. Where equipment is furnished by the owner and installed by the contractor, the contractor's responsibilities shall remain as indicated above except that the owner will assist in enforcing the stipulated manufacturer's warranty.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION 23 00 00**

## **SECTION 23 01 00 – MECHANICAL SUBMITTALS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 GENERAL**

- A. Shop drawing Submittals shall comply with the requirements of Division 1, Section 01 33 00, and with the requirements of this Section. Shop Drawing Submittals shall include specially-prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements, and similar information not in standard printed form for general application to a range of similar projects. Performance curves shall show the full operating range of the proposed equipment
- B. Shop Drawing Submittals shall also include product data which includes standard printed information on materials, products, and systems; not specially-prepared for this project, but with the designation of selections from among available choices for this project clearly identified.

#### **1.3 SUBMITTAL REQUIREMENTS**

- A. Coordination and Sequencing: Coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for same work, and for interfacing units of work, so that one will not be delayed for coordination of Architect/Engineer's review with another.
- B. Preparation of Submittals: Provide permanent marking on each submittal to identify project, date, contractor, subcontractor, submittal name and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking and provide space for Architect's/Engineer's "Action" marking. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through Contractor's office will be returned by Architect/Engineer "without action".
- C. Provide Contractor's certification on form, ready for execution, stating that information submitted complies with requirements of contract documents. Failure to fully review submittals for compliance with contract documents may result in rejection by the Architect/Engineer requiring re-submittal by the contractor. Contractor shall pay the Architect/Engineer for review of all re-submittals in accordance with Section 23 00 00 "Mechanical General Provisions".

#### **1.4 SUBMITTAL LIST**

- A. Shop drawings shall be submitted for, but not limited to, the items listed in each section of the specifications. Submittals, in addition to those listed, may be required by the Architect/Engineer. The following is a summary list of submittals required for the project.

City of Colorado Springs  
Municipal Court Building DHW Replacement

<b>SECTION</b>	<b>ITEM</b>	<b>DATE RECEIVED BY A/E</b>	<b>TRANSMITTAL NO.</b>	<b>DATE RETURNED</b>
23 00 00	Record Drawings			
23 00 00	Maintenance & Operations Manuals			
23 05 93	Testing, Adjusting & Balancing Report			
23 09 00	Electric Control System			
23 51 00	Breachings Chimneys and Stacks			

**END OF SECTION 23 01 00**

## **SECTION 23 05 00 - BASIC MECHANICAL MATERIALS AND METHODS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Extent of basic mechanical materials and methods work required by this section is indicated on drawings and schedules, and/or specified in other Division-23 sections.
- B. Types of basic mechanical materials and methods specified in this section include the following:
  - 1. Mechanical equipment nameplate data.
  - 2. Selective demolition including:
    - a. Nondestructive removal of materials and equipment for reuse or salvage as indicated.
    - b. Dismantling mechanical materials and equipment made obsolete by these installations.
  - 3. Miscellaneous metals for support of mechanical materials and equipment.
  - 4. Joint sealers for sealing around mechanical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.
  - 5. Mechanical Identification of mechanical materials and equipment.
  - 6. Painting of mechanical materials and equipment.

#### **1.2 SUBMITTALS**

- A. General: Submit the following in accordance with Conditions of Contract, Division 1 Specification Sections, and Section 23 01 00.
- B. Product data for the following products:
  - 1. Joint sealers.
- C. Shop drawings detailing fabrication and installation for metal fabrications, and wood supports and anchorage for mechanical materials and equipment.
- D. Coordination drawings for access panel and door locations.
- E. Samples of joint sealer, consisting of strips of actual products showing full range of colors available for each product.
- F. Welder certificates, signed by Contractor, certifying that welders comply with requirements specified under "Quality Assurance" article of this Section.
- G. Schedules indicating proposed methods and sequence of operations for selective demolition prior to commencement of Work. Include coordination for shut-off of utility services and details for dust and noise control.
  - 1. Coordinate sequencing with construction phasing and Owner occupancy specified in Division 1 Section "Summary of Work."

#### **1.3 QUALITY ASSURANCE**



City of Colorado Springs  
Municipal Court Building DHW Replacement

- A. Installer Qualifications: Engage an experienced Installer for the installation and application of joint sealers, access panels, and doors.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Fire-Resistance Ratings: Where a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating shown.
  - 1. Provide UL Label on each fire-rated access door.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver joint sealer materials in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle joint sealer materials in compliance with the manufacturers' recommendations to prevent their deterioration and damage.

1.5 PROJECT CONDITIONS

- A. Conditions Affecting Selective Demolition: The following project conditions apply:
  - 1. Protect adjacent materials indicated to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
  - 2. Locate, identify, and protect mechanical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.
- B. Environmental Conditions: Apply joint sealers under temperature and humidity conditions within the limits permitted by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.

1.6 SEQUENCE AND SCHEDULING

- A. Coordinate the shut-off and disconnection of utility services with the Owner and the utility company.
- B. Notify the Architect/Engineer and Owner at least 5 days prior to commencing demolition operations.
- C. Perform demolition in phases as indicated.

**PART 2 - PRODUCTS**

2.1 MECHANICAL EQUIPMENT NAMEPLATE DATA

- A. Nameplate: For each piece of power operated mechanical equipment provide a permanent operational data nameplate indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location..

## 2.2 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.
- F. Fasteners: Zinc-coated, type, grade, and class as required.

## 2.3 MISCELLANEOUS LUMBER

## 2.4 JOINT SEALERS

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.
- B. Colors: As selected by the Architect from manufacturer's standard colors.
- C. Elastomeric Joint Sealers: Provide the following types:
  - 1. One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.
  - 2. One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes.
  - 3. Products: Subject to compliance with requirements, provide one of the following:
    - a. One-Part, Nonacid-Curing, Silicone Sealant:
      - 1) "Chem-Calk N-Cure 2000," Bostic Construction Products Div.
      - 2) "Dow Corning 790," Dow Corning Corp.
      - 3) "Silglaze N SCS 2501," General Electric Co.
      - 4) "Silpruf SCS 2000," General Electric Co.

- 5) "864," Pecora Corp.
- 6) "Rhodorsil 5C," Rhone-Poulenc, Inc.
- 7) "Spectrum 1," Tremco, Inc.
- 8) "Spectrum 2," Tremco, Inc.
- 9) "Dow Corning 795," Dow Corning Corp.
- 10) "Rhodorsil 6B," Rhone-Poulenc, Inc.
- 11) "Rhodorsil 70," Rhone-Poulenc, Inc.
- 12) "Omnisea," Sonneborn Building Products Div.
- 13) "Chem-Calk 100," Bostic Construction Products Div.
- 14) "Gesil N SCS 2600," General Electric Co.

b. One-Part, Mildew-Resistant, Silicone Sealant:

- 1) "Dow Corning 786," Dow Corning Corp.
- 2) "SCS 1702 Sanitary," General Electric Co.
- 3) "863 #345 White," Pecora Corp.
- 4) "Rhodorsil 6B," Rhone-Poulenc, Inc.
- 5) "Proglaze White," Tremco, Inc.
- 6) "OmniPlus," Sonneborn Building Products Div.

D. Acrylic-Emulsion Sealants: One-part, nonsag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications on interior and protected exterior locations involving joint movement of not more than plus or minus 5 percent.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. "Chem-Calk 600," Bostic Construction Products Div.
- b. "AC-2-," Pecora Corp.
- c. "Sonolac," Sonneborn Building Products Div.
- d. "Tremco Acrylic Latex 834," Tremco, Inc.

## 2.5 FIRE BARRIER PENETRATIONS

A. General: All cracks, voids, or holes for the passing of mechanical and electrical items through fire rated floors, walls and ceilings and having a fire rating of 1 hour or more shall be sealed with a fire barrier caulk, putty, or sealant. Caulk, putty, and sealant systems shall be installed in accordance with the manufacturers recommendations to maintain a fire rating of 3 hours minimum.

B. Fire-Resistant Joint Sealers: Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors. Sealants and accessories shall have fire-resistant ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.

C. Fire-Resistant Caulk:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. "Dow Corning Fire Stop Foam," Dow Corning Corp.
- b. "Pensil 851," General Electric Co.
- c. "3M" CP 25 Caulk or 303 Putty

## 2.6 MECHANICAL IDENTIFICATION

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.
- B. Equipment nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
  - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
  - 2. Location: Accessible and visible location.
- C. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.
  - 1. Fabricate in sizes required for message.
  - 2. Engrave with engraver's standard letter style, of sizes and with wording to match equipment identification.
  - 3. Punch for mechanical fastening.
  - 4. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches long; 1/8 inch for larger units.
  - 5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- D. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
  - 1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."
- E. Provide engraved plastic-laminate signs for each piece of equipment with equipment tag matching schedules and metal nameplate.

## 2.7 PAINTING, FINISHING

- A. Painting of mechanical and electrical work exposed in occupied spaces, except mechanical and electrical machine rooms and maintenance/service space; and work exposed on the exterior is specified and performed under other divisions of these specifications.
- B. Factory finishes, shop painting, and special protective coatings are specified in the individual equipment specification sections.
- C. Where factory finishes are provided on equipment and no additional field painting is specified, all marred or damaged surfaces shall be touched up or refinished so as to leave a smooth, uniform finish at the time of final inspection.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers and access panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION FOR JOINT SEALERS

- A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.
- B. Apply joint sealer primer to substrates as recommended by joint sealer manufacturer. Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 SELECTIVE DEMOLITION

- A. General: Demolish, remove, demount, and disconnect abandoned mechanical materials and equipment indicated to be removed and not indicated to be salvaged or saved.
- B. Materials and Equipment to be Salvaged: Remove, demount, and disconnect existing mechanical materials and equipment indicated to be removed and salvaged, and deliver materials and equipment to the location designated for storage by Owner.
- C. Disposal and Cleanup: Remove from the site and legally dispose of demolished materials and equipment not indicated to be salvaged.
- D. Mechanical Materials and Equipment: Demolish, remove, demount, and disconnect the following items:
  - 1. Inactive and obsolete piping, fittings and specialties, equipment, ductwork, controls, fixtures, and insulation.
    - a. Piping and ducts embedded in floors, walls, and ceilings may remain if such materials do not interfere with new installations. Remove materials above accessible ceilings. Drain and cap piping and ducts allowed to remain.
  - 2. Perform cutting and patching required for demolition in accordance with Division 1 Section "Cutting and Patching."

### 3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code."

### 3.5 APPLICATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.

1. Comply with recommendations of ASTM C 962 for use of elastomeric joint sealants.
  2. Comply with recommendations of ASTM C 790 for use of acrylic-emulsion joint sealants.
- B. Tooling: Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
- C. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around mechanical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

**END OF SECTION 23 05 00**

## **SECTION 23 05 29 – HANGERS AND SUPPORTS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Extent of supports and anchors required by this section is indicated on drawings and/or specified in other Division-23 sections.
- B. Types of supports and anchors specified in this section include the following:
  - 1. Horizontal-Piping Hangers and Supports.
  - 2. Vertical-Piping Clamps.
  - 3. Hanger-Rod Attachments.
  - 4. Building Attachments.
  - 5. Pipe Covering Protection Saddles and Shields.
  - 6. Spring Hangers and Supports.
  - 7. Pipe Anchors.
  - 8. Pipe Alignment Guides
  - 9. Miscellaneous Materials.
  - 10. Equipment Supports.
- C. Supports and anchors furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division-23 sections.

#### **1.2 QUALITY ASSURANCE**

- A. Manufacturers Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
  - 1. Code Compliance: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.
  - 2. ANSI/ASME B31.1 – Power Piping.
  - 3. UL and FM Compliance: Provide products which are UL-listed and FM approved.
  - 4. MSS Standard Compliance:
    - a. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58.
    - b. Select and apply pipe hangers and supports, complying with MSS SP-69.
    - c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
    - d. Terminology used in this section is defined in MSS SP-90.

#### **1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing

Manufacturer's figure number, size, location, and features for each required pipe hanger and support.

- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly or components.
- C. Maintenance Data: Submit maintenance data and parts list for each type of support and anchor. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Section 23 00 00.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Pipe Hangers and Supports
    - a. Anvil.
    - b. B-Line Systems, Inc.
    - c. Carpenter and Patterson, Inc.
    - d. Corner & Lada Co., Inc.
    - e. Elcen Metal Products Co.
    - f. Fee & Mason Mfg. Co., Div. Figgie International.
    - g. PHD Manufacturing, Inc.
    - h. Piping Technology & Products, Inc.
    - i. Unistrut.
  - 2. Pipe Covering Protection Saddles and Shields
    - a. Anvil.
    - b. Elcen Metal Products Co.
    - c. PHD Manufacturing, Inc.
    - d. Pipe Shields, Inc.
    - e. Piping Technology & Products, Inc.
  - 3. Pipe Alignment Guides
    - a. Adsc0.
    - b. Anvil.
    - c. Heppan Precision Products, Inc.
    - d. Metraflex (The) Co.
    - e. PHD Manufacturing, Inc.
    - f. Piping Technology and Products.
  - 4. Roof Equipment Supports
    - a. Custom Curb, Inc.
    - b. Pate Co.
    - c. Thycurb Div.; Thycurb Corp.



## 2.2 HORIZONTAL-PIPING HANGERS AND SUPPORTS

- A. General: Except as otherwise indicated, provide factory- fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems. Provide hot dipped galvanized steel hangers and supports in tunnels, shallow concrete trenches, and valve vaults.
- B. Adjustable Steel Clevis Hangers: MSS Type 1.
- C. Yoke Type Alloy Steel Pipe Clamps: MSS Type 2.
- D. Steel Double Bolt Pipe Clamps: MSS Type 3.
- E. Steel Pipe Clamps: MSS Type 4.
- F. Pipe Hangers: MSS Type 5.
- G. Adjustable Swivel Pipe Rings: MSS Type 6.
- H. Adjustable Steel Band Hangers: MSS Type 7.
- I. Adjustable Band Hangers: MSS Type 9.
- J. Adjustable Swivel Rings, Band Type: MSS Type 10.
- K. Split Pipe Rings: MSS Type 11.
- L. Extension Split Pipe Clamps: MSS Type 12.
- M. U-Bolt: MSS Type 24.
- N. Clips: MSS Type 26.
- O. Pipe Slides and Slide Plates: MSS Type 35, Structural tee slide assembly with PTFE slide bearings, including one of the following plate types:
  - 1. Plate: Unguided type.
  - 2. Plate: Guided type.
  - 3. Plate: Hold-down clamp type.
- P. Pipe Saddle Supports: MSS Type 36, including steel pipe base- support and cast-iron floor flange.
- Q. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.
- R. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast-iron floor flange.
- S. Single Pipe Rolls: MSS Type 41.

- T. Adjustable Steel Yoke Roller Hangers: MSS Type 43.
- U. Pipe Roll Stands: MSS Type 44.
- V. Pipe Rolls and Plates: MSS Type 45.
- W. Adjustable Pipe Roll Stands: MSS Type 46.

### 2.3 VERTICAL-PIPING CLAMPS

- A. General: Except as otherwise indicated, provide factory- fabricated vertical-piping clamps complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper piping systems. Provide hot dipped galvanized steel clamps in tunnels, shallow concrete trenches, and valve vaults.
- B. Two-Bolt Riser Clamps: MSS Type 8.
- C. Four-Bolt Riser Clamps: MSS Type 42.

### 2.4 HANGER-ROD ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory- fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems. Provide hot dipped galvanized steel hanger rod attachments in tunnels, shallow concrete trenches, and valve vaults.
- B. Steel Turnbuckles: MSS Type 13.
- C. Steel Clevises: MSS Type 14.
- D. Swivel Turnbuckles: MSS Type 15.
- E. Malleable Iron Sockets: MSS Type 16.
- F. Steel Weldless Eye Nuts: MSS Type 17.

### 2.5 BUILDING ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory- fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper piping systems. Provide hot dipped galvanized steel building attachments in tunnels, shallow concrete trenches, and valve vaults.
- B. Concrete Inserts: MSS Type 18.

- C. Top Beam C-Clamps: MSS Type 19.
- D. Side Beam or Channel Clamps: MSS Type 20.
- E. Center Beam Clamps: MSS Type 21.
- F. Welded Beam Attachments: MSS Type 22.
- G. C-Clamps: MSS Type 23.
- H. Side Beam Clamps: MSS Type 25.
- I. Adjustable Beam Clamps: MSS Type 27.
- J. Steel Beam Clamps W/Eye Nut: MSS Type 28.
- K. Linked Steel Clamps W/Eye Nut: MSS Type 29.
- L. Malleable Beam Clamps: MSS Type 30.
- M. Steel Brackets: One of the following for indicated loading:
  - 1. Light Duty: MSS Type 31.
  - 2. Medium Duty: MSS Type 32.
  - 3. Heavy Duty: MSS Type 33.
- N. Side Beam Brackets: MSS Type 34.
- O. Plate Lugs: MSS Type 57.
- P. Horizontal Travelers: MSS Type 58.

## 2.6 PIPE COVERING PROTECTION SADDLES AND SHIELDS

- A. General: Except as otherwise indicated, provide pipe covering protection saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size pipe covering protection saddles and shields for exact fit to mate with pipe insulation.
- B. Pipe Covering Protection Saddles: MSS Type 39; steel saddle welded to pipe, fill interior voids with segments of insulation matching adjoining insulation.
- C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- D. Thermal Hanger Shields: Constructed of 360 degree insert of high density, 100 PSI, water-proofed calcium silicate, encased in 360 degree sheet metal shield. Provide assembly of same thickness as adjoining insulation.

## 2.7 SPRING HANGERS AND SUPPORTS

- A. General: Except as otherwise indicated, provide factory- fabricated spring hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit piping systems, in accordance with MSS SP-69 and manufacturer's published

product information. Use only one type of one manufacturer for each piping service. Select spring hangers and supports to suit pipe size and loading.

- B. Restraint Control Devices: MSS Type 47.
- C. Spring Cushion Hangers: MSS Type 48.
- D. Spring Cushion Roll Hangers: MSS Type 49.
- E. Spring Sway Braces: MSS Type 50.
- F. Variable Spring Hangers: MSS Type 51; preset to indicated load and limit variability factor to 25%.
- G. Variable Spring Base Supports: MSS Type 52; preset to indicated load and limit variability factor to 25%; include load flange.
- H. Variable Spring Trapeze Hangers: MSS Type 53; present to indicated load and limit variability factor to 25%.
- I. Constant Supports: Provide one of the following types, selected to suit piping system. Include auxiliary stops for erection and hydrostatic test, and field load-adjustment capability.
  - 1. Horizontal Type: MSS Type 54.
  - 2. Vertical Type: MSS Type 55.
  - 3. Trapeze Type: MSS Type 56.

## 2.8 MISCELLANEOUS MATERIALS

- A. General: Provide hot dipped galvanized steel materials.
- B. Structural Steel: ASTM A 36/A36M, steel Plates, Shapes and Bars, black and galvanized.
- C. Bolts and Nuts: ASME B18.10 or ASTM A183, steel, hex-head, track bolts and nuts.
- D. Washers: ASTM F844, steel, plain, flat washers.
- E. Grout: ASTM C1107, Grade B, non-shrink, nonmetallic.
  - 1. Characteristics include post-hardening, volume-adjusting, drying, hydraulic-cement-type grout that is non-staining, non-corrosive, nongaseous and is recommended for both interior and exterior applications.
  - 2. Design Mix: 5,000-psi (34.5Mpa), 28-day compressive strength.
  - 3. Water: Potable.
  - 4. Packaging: Premixed and factory-packaged.
- F. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and construction materials where used. Fasteners for fire protection systems include UL listing and FM approval.
- G. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

## **PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PREPARATION

- A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.
- B. Prior to installation of hangers, supports, anchors and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.3 INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Install reinforcing bars through openings at top of inserts.
- B. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100mm) thick.
- C. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100mm) thick.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal piping to be supported together on field-fabricated, heavy-duty trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

- B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- D. Support fire protection systems piping independently of other piping.
- E. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.
- F. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- G. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ASME B31.1 are not exceeded.
- I. Insulated Piping: Comply with the following installation requirements.
  - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.1.
  - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated.
  - 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:
 

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
  - 4. Insert Material: Length at least as long as the protective shield.
  - 5. Thermal-Hanger Shields: Install with insulation of same thickness as piping insulation.

### 3.5 INSTALLATION OF ANCHORS

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ASME B31.1, and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ASME B31.1 and with AWS standards.
- C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
- D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.6 EQUIPMENT SUPPORTS

- A. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.
- B. Furnish roof equipment supports to Contractor for installation as part of work of Division 7.

3.7 ADJUSTING AND CLEANING

- A. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.

3.8 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint and paint exposed areas immediately after erection of hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal is specified in Division 9 Section "Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanized-repair paint to comply with ASTM A 780.

**END OF SECTION 23 05 29**

## **SECTION 23 08 00 - MECHANICAL COMMISSIONING REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. General Commissioning Requirements 01 91 00
- B. All applicable provisions of the divisions 23, 26 and 28 also apply to this section.

#### **1.2 SUMMARY**

- A. This section includes general requirements that apply to the implementation of the commissioning process in addition to section 01 91 00.

#### **1.3 EQUIPMENT/SYSTEMS TO BE COMMISSIONED**

- A. The following equipment/systems will be commissioned in this project:
  - 1. Domestic Water Heater
  - 2. Recirculation Pump

#### **1.4 RESPONSIBILITIES**

- A. The general responsibilities of various parties in the commissioning process are provided in section 01 91 00. The specific responsibilities may also be identified in the Technical Specifications.
- B. Mechanical Contractor, their subcontractors, and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
  - 1. Provide detailed startup procedures
  - 2. Include the cost of commissioning assistance in the total contract price.
  - 3. Ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents.
  - 4. Attend and participate in commissioning team meetings. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxA, CM, A/E, and PM and Owner to finalize the detailed commissioning procedures and schedule.
  - 5. Review and accept construction checklists provided by the commissioning authority.
  - 6. Complete construction checklists as work is completed and provide to CxA.
  - 7. Accomplish commissioning process test procedures.
  - 8. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  - 9. Cooperate with the CxA for resolution of issues recorded in the "Issues Log".
  - 10. Prepare O&M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions.
  - 11. Provide the training of Owner personnel.
  - 12. Ensure that subcontractors and vendors provide assistance for seasonal or deferred performance testing, performed by the CxA, according to the specifications.
  - 13. Ensure that subcontractors correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.
  - 14. Perform all warranty work for materials furnished under the contract for the time specified in the contract, including all warranties and curing all latent defects within the time period provided in the contract.
- C. TAB Contractor Responsibilities:
  - 1. Contract Documents Review: With the CxA, review the Contract Documents before developing TAB procedures. Identify possible balancing device accessibility, effectiveness, and discontinuities in the Contract Documents (this TAB Subcontractor



review of the Contract Documents may satisfy requirements specified in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" item 3.1.A).

2. In conjunction with CxA, TAB Contractor shall verify the following:
    - a. Accessibility of equipment and components required for TAB Work.
    - b. Adequate number and placement of balancing valves to allow proper balancing and recording of water flow.
    - d. Adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both TAB and commissioning testing.
    - e. Air and water flow rates have been specified and compared to rated equipment output capacities.
  4. TAB Contractor shall participate in tests as typically specified in sections "HVAC Instrumentation and Controls" and "Sequence of Operation."
- D. HVAC Instrumentation and Control Contractor Responsibilities:
1. Assist CxA with review control designs for design compliance, controllability with respect to actual equipment to be installed, and recommend adjustments to control designs and sequence of operation descriptions.
  2. Assist CxA in preparation of BAS control tests.
  3. Perform BAS control tests and complete prepared test forms for CxA review prior to CxA testing.
  5. Contractor shall assist CxA to obtain trends of the system operating parameters to evaluate acceptable system functionality. The requirements of trending shall be specified with FPT procedures. Contractor shall establish these trends, ensure they are being stored properly, provide CxA web-based remote access, and forward the data in electronic format to the CxA.
  7. Contractor shall assign adequate personnel and tools for FPT tests, and as required for scheduled retests.
- E. Vendors
1. Provide all requested submittal data, including detailed startup procedures and specific responsibilities of the Owner to keep warranties in force.
  2. Assist in equipment testing per agreements with subcontractors and/or contractor.
  3. Include cost of all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing, operating, and maintaining equipment according to these contract documents in the base bid price to the contractor.
  4. Analyze specified products and verify that the A/E has specified the newest, most current equipment reasonable for this project's scope and budget.
  5. Provide requested information regarding equipment sequence of operation and testing procedures.
  6. Review construction checklists and test procedures for equipment installed by factory representatives.

## **PART 2 - PRODUCTS**

### **2.1 TEST EQUIPMENT**

- A. Refer to General Commissioning Requirements 01 91 00.

## **PART 3 - EXECUTION**

City of Colorado Springs  
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- 3.1 COMMISSIONING MEETINGS
  - A. Refer to General Commissioning Requirements 01 91 00.
- 3.2 STARTUP, CONSTRUCTION CHECKLISTS, AND INITIAL CHECKOUT
  - A. Refer to General Commissioning Requirements 01 91 00.
  - B. Refer to Commissioning Checklists 23 08 00.01.
- 3.3 OPERATIONS AND MAINTENANCE MANUALS / DATA
  - A. Refer to General Commissioning Requirements 01 91 00.
- 3.4 FUNCTIONAL PERFORMANCE TESTING
  - A. Refer to General Commissioning Requirements 01 91 00.
- 3.5 TRAINING OF OWNER PERSONNEL
  - A. Refer to General Commissioning Requirements 01 91 00.
- 3.6 DEFERRED TESTING
  - A. Refer to General Commissioning Requirements 01 91 00.
- 3.7 COMMISSIONING DOCUMENTS
  - A. Refer to General Commissioning Requirements 01 91 00.

**END OF SECTION 23 08 00**

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## **SECTION 23 09 00 – ELECTRIC CONTROL SYSTEM**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General provisions of the Contract, including General, Supplementary and Special Conditions, the Owner's policy concerning the Executive Order Compliance and Division 1 - General Requirements, apply to work specified in this section. Subcontractor must familiarize himself with the terms of the above documents.

#### **1.2 Scope/Intent**

- A. The intent of the project is to replace all existing domestic water heater and domestic hot water pump controls.
- B. Controls shall be provided by JCI (Johnson Controls) and communicate with City of Colorado Springs municipal wide supervisory controls. Coordinate with Sara Littlejohn 615-305-9659
- C. Global Control System to include:
  - 1. Provide SNE 2200 Engine and communication wiring
  - 2. Provide facility operations software
  - 3. Provide 4 hours of customer training
  - 4. Provide project engineering, drawings, installation, check-test-start, programming, project management and a one-year parts and labor warranty
  - 5. IP drop provided by building IT team

#### **1.3 QUALITY ASSURANCE**

- A. Refer to paragraph "Acceptable Manufacturers" for acceptable pre-qualified temperature control sub-contractors for the work specified in this section.
- B. Installers Qualifications: Firms specializing and experienced in electric control system installations for not less than 5 years.
- C. Codes and Standards:
  - 1. Electrical Standards: Provide electrical products (line voltage) which have been tested, listed and labeled by UL and comply with NEMA standards.
  - 2. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electric control systems.
  - 3. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.
  - 4. NEMA EMC1 - Energy Management Systems Definitions.
  - 5. ASME MC85.1 - Terminology for Automatic Control.
  - 6. NEMA ICS1 - Industrial Control and Systems.
  - 7. UL Compliance: Provide control system listed under UL 916 for Control of Mechanical Systems and Temperature Regulating Systems.

8. NFPA Compliance: Comply with NFPA 70 "National Electrical Code.

#### 1.4 DESCRIPTION OF WORK

- A. Provide all controls and instrumentation work necessary for the construction of the project as indicated on the Drawings and specified herein. Such work includes, but is not limited to the following:
  1. The system of electronic temperature controls utilizing microprocessor-based digital controllers shall include all controlled equipment as shown on drawings, herein specified, and as shown on point list.
  2. Provide control and interface panels and all necessary transducers, EPU's, relays, switches and other devices for the complete control system as specified herein.
- B. The work included under this section of the specifications and drawings includes providing controls for new equipment and integrating the new equipment with the existing building control system. The new equipment will also require new thermostats, CO2 sensors, and humidistats.
- C. Provide updated controls graphics for each new system.
- D. The point list identifies those points that are to be addressed by the digital controller and incorporated into the new electronic temperature control system.
- E. The system of automatic temperature control shall be furnished and installed as required for proper control of the HVAC equipment and shall include the furnishing and installation of all equipment materials and labor necessary for or reasonably incidental to the complete control system, and if shown but not specified or if specified but not shown shall be provided as though delineated in both specifications and drawings.
- F. The contractor is to furnish and install a complete temperature control system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification.
- G. The contractor is to obtain and pay for all necessary construction permits and licenses.
- H. The Drawings and Specifications are not intended to show all details. The Contractor is to secure satisfactory information before submitting the proposal and include in the proposal a sum sufficient to cover all items of labor and material required for the complete installation of the devices and systems described.
- I. All work performed under this Section of the Specification shall comply with all codes, laws and governing bodies. If the Drawings and/or Specifications are in conflict with governing codes, the Contractor shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this Specification and associated drawings exceeds governing code requirements, this Specification shall govern.
- J. The Contractor shall execute his work in such a manner as to minimize down time and prevent delays in the scheduled completion date.

#### 1.5 COORDINATED WORK

- A. This Contractor shall cooperate with other contractors performing work on this project as necessary to achieve a complete neatly fitted installation for each condition. To that end, each

contractor shall consult the drawings and specifications for all trades to determine nature and extent of others' work.

- B. It shall be the duty of the Contractor to work in cooperation with the owner and other contractors and so arranging his work that the entire project will be delivered complete in the best possible condition by the scheduled completion date.

#### 1.6 CLEAN-UP

- A. This Contractor shall maintain the premises in an orderly fashion at all times during the construction period. He shall remove all cartons, containers, crates, etc., as soon as their contents have been removed and he shall also remove all debris, caused by his work daily. All cartons, debris, etc., shall be removed from the site and premises at the sole expense of the Contractor.
- B. At the completion of the work, the Contractor shall clean all of his work, equipment, etc., free from dust, etc., and leave the work in good housekeeping fashion in a manner acceptable to the Owner.

#### 1.7 SUBMITTALS

- A. Shop Drawings: Provide shop drawings for both the hardware and applications software to be utilized in the temperature control system. The following is a minimum submittal requirement:

##### 1. Hardware:

- a. Include a complete bill of material of equipment used indicating quantity, manufacturer and model number and other relevant technical data.
- b. Include manufacturer's description and technical data, such as, performance curves, product specification sheets and installation/maintenance instructions for the items listed and other items relevant but not listed below:

- 1) Digital Controller
- 2) D/A and A/D Converters
- 3) Modem
- 4) Power Supply
- 5) Sensors
- 6) Batteries
- 7) Relays/Switches
- 8) Operator Interface Equipment
- 9) Control Panels
- 10) Flow Switches
- 11) PC Printer and CRT

- c. Provide complete coded interconnection wiring diagrams for each electrically operated piece of equipment. Show all termination and wiring numbers.
- d. Provide schematic wiring diagrams for each control panel. Show all terminations and wiring numbers.
- e. Provide schematic wiring diagrams for all field sensors and controllers.

##### 2. Software:

- a. Provide a complete description of the applications programming language and instructions on how to program and reprogram any portion of the system.
  - b. Provide programming flow diagrams of the applications software.
  - c. Include a complete description of the operation of the temperature control system including sequences of operation.
  - d. Provide line-by-line applications software utilized to accomplish the control strategies called for in this specification.
  - e. Provide the control loop algorithms/calculations proposed.
  - f. Provide a digital controller point list including both inputs and outputs indicating I/O point number, the controlled device associated with the I/O point and the location of the I/O device.
  - g. Provide other documentation not listed above if deemed necessary by the Owner or Engineer to enable understanding of the applications software and algorithms proposed for proper functioning of the control system.
3. General:
- a. No construction may begin until shop drawings are approved by the Engineer for conformity with the plan and specification design intent.
  - b. Quantities of items submitted will not be reviewed by the Engineer, and is the responsibility of the Contractor.
  - c. When manufacturers cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project will be highlighted or clearly indicated by other means.
  - d. Provide to the Engineer any additional information or data which the Engineer deems necessary to determine compliance with these specifications or which he deems valuable to the Owner in documenting the system to be installed.
- B. Construction Record Documents: At the completion of the work, the Contractor shall submit three (3) revised signed and certified sets of documents as construction record documents. Construction record documents should include significant departures from the Contractor's originally approved documents or the Engineer's documents.
1. Construction record documents to be submitted are those listed under shop drawings pertaining to both hardware and software.
  2. Construction record documents for software also requires that the Contractor supply to the Owner the project software in storage on written/paper form and on compact disc.
- C. Operating and Maintenance (O&M) Manuals: Three (3) O&M manuals shall be submitted for approval and shall include the following, at a minimum, bound in three (3) ring hardback binders after system acceptance.
1. Names, addresses and telephone numbers of Contractors installing equipment and systems and the service representative for the system.
  2. Shop drawing hardware and software submittals as well as construction record documentation if not duplication of shop drawing submittals.
  3. Complete descriptions on the maintenance of all system components including sensors, controllers, actuators, etc. The descriptions shall include inspection, periodic preventative maintenance suggestions, system/component failure and diagnosis and the procedure for repair or replacement of defective components.
  4. Definitions of terms utilized where applicable and necessary for complete Owner understanding of the installed system.

## 1.8 START-UP/TESTING

- A. Prior to testing and verifying proper system operation, the Contractor shall furnish the Owner and Engineer, for acceptance, two (2) copies each of the start-up/testing procedure proposed. The Owner and Engineer must approve the check-out procedure prior to start-up/testing.
- B. Submittal of the start-up/testing procedure must be submitted one (1) calendar month prior to the projected construction completion date.
- C. After the procedure is approved and after installation is complete and systems are ready to be placed in regular service, the Contractor shall notify the Owner of this fact in writing.
- D. On the start-up date, the Contractor will have on-site qualified field technicians to place the system in operation, making such tests, adjustments and changes as may be found necessary to insure successful operation of the equipment and systems.
- E. The Contractor is to test and verify proper operation for each control loop.
- F. Each control loop check will verify that the digital controller, watch dog circuit, automatic/manual switch, fail-safe control and electric interlocks are operating as intended to accomplish the control strategy.
- G. Sensor calibrating/operation will be tested to verify that they are operating and within the performance parameters established in this specification.
- H. Each input and output shall be checked to verify that correct terminations/designations of I/O are in place.
- I. Communications to the digital controller shall be tested and verified that it is in working order.
  - 1. On-site communications to the digital controller will be tested as well as on-site communications to the controller.
  - 2. Off-site communications by the digital controller shall be tested to verify that the digital controller is able to initiate and establish communications with a designated terminal off-site for exception reporting/alarms.
- J. Proper operation of all on-site operator interface hardware shall be tested to verify proper operation.
- K. Downloading of applications programs will be tested both from on-site and off-site locations to verify proper operation of downloading procedure.
- L. Reports/trend logs will be retrieved to verify proper operation/format.
- M. All tests will be documented by the Contractor and certified verifying that the tests have been performed and that all deficiencies have been corrected.
  - 1. All testing must be performed and all deficiencies corrected to the Owners satisfaction.
- N. At the end of the start-up/testing, if equipment and systems are operating satisfactory to the Owner and Engineer, the Owner shall sign certificate certifying that the systems operation has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of guaranty.

1.9 GUARANTY



- A. The control systems specified shall be guaranteed free from defects, workmanship and material under conditions for a period of fifteen (15) months after acceptance by the Owner. Any equipment herein described proven to be defective in workmanship or material during guarantee period shall be adjusted, repaired or replaced at no charge to the Owner.
- B. During the guarantee period, software updates/digital controller improvements, i.e., microprocessor chip changes, shall be provided to the Owner at no charge. Written authorization by the Owner must, however, be granted prior to the software or digital controller hardware updates.
- C. The Contractor shall submit an alternate price for an extended service agreement after the end of the one-year warranty. Contract shall include parts, labor, and software. An escalation percentage shall be included for an additional four years.

#### 1.10 TRAINING

- A. Within one (1) week after the temperature control systems has been accepted by the Owner, the Contractor will provide training at the site of the Installation for Owner designated personnel on the operation and maintenance of the system installed. Training sessions shall be limited to four hours per day and two days per week.
- B. The Instructor(s) shall be competent and have full knowledge of the system installed and will provide training specifically oriented to the Owner's installed system.
- C. The training shall utilize the operating and maintenance manual provided for the system as the reference manual and the training will include, at a minimum, the following:
  - 1. Description of the overall control system configuration and physical layout indicating location of all sensors and controlled devices.
  - 2. Description of the control strategies being utilized at the installation.
  - 3. Description of all the key hardware components utilized in the system.
  - 4. Instructions on how to communicate with (command and monitor) the systems digital controller.
  - 5. Description of the programming instructions required to use the system.
  - 6. Description of the requirements to retrieve alarm and trend log formats and how to react to alarm conditions.
  - 7. Description of diagnostic trouble-shooting techniques for the entire system.

## **PART 2 - PRODUCTS**

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide electric control system of one of the following:
  - 1. (LONG) Existing Controls contractor
- B. The function of this section is to establish a minimum quality of hardware to be provided, a minimum quality of installation and to establish equipment or equipment configurations to be utilized for standardization.

- C. All work installed by the temperature control contractor shall be done in a neat and workmanlike manner as determined by the Owner, and acceptable standards for this type of work.
- D. The temperature control contractor will provide hardware as specified to meet all system performance requirements. Should hardware be required to meet the specified system performance which is not specified herein, the contractor shall follow procedures established in the General Conditions.
- E. Where two (2) or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of a single manufacturer.
- F. The digital controller system materials and installation will be addressed in three sections:
  - 1. System Controller.
  - 2. Operator Interface.
  - 3. Field Equipment.
  - 4. Wiring.

## 2.2 ARCHITECTURE

- A. Diagram shown on the drawings shows the major hardware components which will form the digital control system. This diagram is included for clarification purposes only and is not intended to dictate a specific control system configuration.
- B. The following terms, when used in this section, will be as defined here.
  - 1. Digital Controller: A microprocessor-based controller supplied by an approved manufacturer. The term digital controller will be used to designate a package of equipment as supplied by the manufacturer.
  - 2. System Controller: A digital controller plus associated equipment. The term system controller will be used to designate a specific group of equipment which will be supplied either as part of the digital controller package or supplied independently to meet the system controller specification.
  - 3. Field Equipment: Equipment through which the system controller will interface with the facilities environmental, mechanical, and electrical systems.
  - 4. Operator Interface: Equipment through which operator personnel will be able to access the digital controller.

## 2.3 FIELD EQUIPMENT

- A. General:
  - 1. All field interface devices, where practical, will be mounted in the field interface panel. All other field interface devices will be mounted at the point of field interface in a separate enclosure suitable for the location. When the manufacturer provides an enclosure/packaging of the device or sensor which protects the device from dust, moisture, conceals integral wiring and moving parts, this enclosure will be acceptable.
  - 2. Every field interface device and every field termination will be labeled using words, letters or numbers with permanent mechanically fabricated or printed tags exactly corresponding to as-built drawings.
- B. Field Interface Panel:

1. General:
    - a. Mounted within the field interface panel will be power supplies for sensors, interfacing relays and contactors, output point logic override for safety pneumatic to electric and electric to pneumatic transducers, output status indication, etc.
    - b. Where shown on the plans, the field interface panel will be firmly attached to a permanent wall or it shall be freestanding.
  2. Enclosure:
    - a. Supply an enclosure of all steel construction with baked enamel finish, NEMA, Type 1 rated with a hinged type door and keyed lock or equivalent rigid construction. The enclosure shall be sized for twenty (20) percent spare mounting space.
  3. Terminations:
    - a. All wiring to and from the field interface panel will be to screw type terminals. Analog or communications wiring may use the field interface panel as a raceway without terminating.
    - b. All wiring within the field interface panel will be run in plastic wiring duct to give a neat and workmanlike appearance.
  4. Output Status:
    - a. Every output shall have a visual indication of it's status. Binary outputs will use a light emitting diode (LED). Electrical analog outputs will use either a voltmeter or ammeter. Pneumatic analog outputs will use an air gauge.
    - b. All output status indication will be amounted in a common location within the field interface panel on a sub-panel. Provide sufficient room for all used and all spare outputs. Each output will be properly labeled.
  5. Pulse Width Modulation to Continuous Analog Output:
    - a. Where called for, provide equipment to convert a binary output from pulse width modulation to a continuous analog signal. Binary to electric will be through the use of a stepping motor potentiometer arrangement. Binary to pneumatic will be through the use of a pulsed feed and bleed solenoids.
- C. Analog Inputs:
1. The temperature control contractor shall provide equipment for analog sensing as indicated in the point list. This will include the sensor, signal conditioning equipment and wiring.
  2. Sensors and signal conditioning equipment provided shall be of the type which are universally accepted in the industry, can easily be second sourced and could be utilized with the majority of Digital Controller manufacturer's equipment.
  3. Transducers may be supplied as an integral unit with the field sensor, mounted separately from the sensor, in a field interface panel or be packaged as part of the Digital Controller providing specified sensing accuracy is achieved. All transducers shall be calibratable.
  4. Transduced analog signals shall be of one of the following forms: 4-20 MA, 0-5V, or 0-10V. Frequency modulated signals will not be allowed.

- a. Exception: Direct thermistor input to the Digital Controller for A to D conversion and software linearization will be acceptable.
5. Sensor and transducer selection shall be appropriate for the duty and mounting location including but not limited to the following items:
- a. The sensor/transducer will be appropriately packaged for the location.
    - 1) Architectural housing for space wall mounting.
    - 2) Weatherproof/sunshield housing for outside mounting.
    - 3) Thermal well housing for water applications.
    - 4) Dust and physical protective housing for duct mounting.
  - b. The sensor/transducer will be appropriately selected to withstand ambient conditions.
    - 1) Moisture or condensation where it is a factor.
    - 2) Vibration from ductwork, equipment, etc.
    - 3) Reasonably expected transient conditions such as temperatures, pressures, humidities, etc., outside the normal sensing range.
  - c. The sensor/transducer will be appropriately selected to most closely match the expected sensing range.
  - d. The system shall maintain the specified end-to-end accuracy throughout the warranty period from sensor to Digital Controller read-out.
  - e. Temperature Sensors: Temperature sensors will be by the use of thermistors or RTD's. Thermocouples or solid state temperature sensors will not be allowed.
  - f. Space temperature applications with a range of 50 to 120°F. within plus or minus 0.5°F. Sensor shall have built in built-in setpoint potentiometer.
  - g. Duct temperature applications with a range of 25 to 130°F within plus or minus 0.5°F. Averaging type temperature sensors shall utilize a resistance sensing element incorporated in a copper capillary of 20 feet.
  - h. Outside air temperature applications with a range of minus 20 to plus 100°F within plus or minus 1.0°F. Sensor shall be available for outdoor or duct mounting.
  - i. Water temperature applications with a range of 30 to 100F. within plus or minus 0.5°F; the range of 100 to 250°F within plus or minus 1.0°F; and applications for the purpose of performing BTU calculations using differential temperatures to within plus or minus 0.15°F.
  - j. Humidity Sensors:
    - 1) Space humidity applications within a range of 20 to 80 percent plus or minus 2 percent.
    - 2) Duct humidity applications within a range of 20 to 80 percent plus or minus 2 percent.
    - 3) Duct humidity applications for high limit control within a range of 0 to 100 percent plus or minus 5 percent.
    - 4) Dew point with a range of 50-70°F. plus or minus 2 degrees F.
  - k. Pressure Sensors: Differential pressure sensor shall vary the output voltage with a change in differential pressure. The sensor shall be connected to the remote controller by means of a three-wire unshielded cable.
    - 1) Space Static Pressure: Pressure sensor shall have a range of .1 inches WC with an accuracy of plus or minus .5 percent of range.

- 2) Duct Static Pressure: Pressure sensor shall have a range suitable for the specific application with an accuracy of plus or minus 1 percent of range. Differential pressure sensors used in laboratory exhaust applications shall be constructed of type 316L stainless steel and shall be UL listed under UL 913 Class 1, Division 1 standards.
- 3) Flow: Air flow applications with a range for the specific application and an accuracy within plus or minus 1.0 percent of maximum design flow. Steam flow applications with a range for the specific applications with an accuracy within plus or minus 1.0 percent of maximum design flow.

- I. Space Sensors: Space sensors shall match D11 standards. Space sensors shall have humidity sensing for systems with humidifiers.
- m. Airflow monitoring: Airflow monitoring shall be provided by the rooftop unit manufacturer and shall be EBTRON gold or engineer approved equal.

D. Analog Outputs:

1. The temperature control contractor shall provide equipment for analog outputs as indicated in the point list. This will include digital to analog conversion and wiring or pneumatic tubing to the controlled device. When required, the analog output signal must be fed back as an analog input. When hardware feedback is not required, the output will be software estimated.
2. All controlled devices which are to be modulated are to receive analog signals of one of the following forms: 4-20 MA, 0-5V, 0-10 volt or 0-20 psi.
3. Digital to analog converters shall be packaged as part of the digital controller and have a minimum resolution of 8 bits plus sign for 256 levels of control.
4. Alternate Method #1: The following method of conversion of a pulsed digital output to an analog signal may be employed.
  - a. 0-20 psi: Pulsed solenoids rate for a minimum 5 million operations and have a response time of less than .1 second.
  - b. Electric: Pulsed motor/potentiometer rated for a minimum of 5 million operations and be able to respond to input impulses of less than .2 second duration.
5. Alternate Method #2: The following method of conversion of a pulsed digital output to an analog signal may be employed.
  - a. Electric: The actuated device may be directly controlled from the digital controller provided that the digital controller in conjunction with the controlled device can give a minimum of 50 levels of control.
    - 1) This method of control cannot be used when analog feedback is required.

E. Digital Inputs:

1. The temperature control contractor shall provide equipment for digital inputs as indicated in the point list.
2. All digital inputs will be electrically isolated from the digital controller either by optical isolation or relays.
  - a. When relays are used, transient suppression shall be placed across the relay contacts.
3. All digital inputs will be provided by dry contacts single pole double throw. The contacts will be wired normally open or normally closed as required.

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4. Pulse Accumulation: For pulse accumulation, provide a buffered input port which will totalize pulses between interrogations. The pulse accumulator shall accept rates up to ten (10) pulses per second.
5. Flow Switches:
  - a. Thermal dispersion type switches (gas or liquid service) shall be two (2) piece design, UL Listed, SPDT snap-acting contacts, adjustable sensitivity with NEMA 4 enclosure. Two (2) piece design shall include the following:
    - 1) Probe: Sensor probe constructed of type 316 stainless steel, 7" long, sized for the application pipe size for temperatures to 240°F.
    - 2) Evaluation Control Monitor: Panel mounted electronic module with DIN rail mounting for 90-240VAC power input applications. Units shall incorporate flow, wire break and temperature monitoring function relays with power on time delay. Function relays shall have normally open and normally closed contacts rated for 4A. Flow and temperature setpoints shall be adjustable through potentiometers by use of a screwdriver. Units shall be jumper selectable for gas or liquid applications. For water flow applications, units shall have a setting range of 5-590FPM velocity. Units shall have the following LED indicators:
      - a) 11 LED flow velocity indication.
      - b) Red LED for wire break indication.
      - c) Red LED for high temperature indication.
    - 3) Accessories: Provide with pipe adapter and cables with straight or angled quick disconnect socket connectors.
    - 4) Manufacturer: IFM Effector 300 or equal.
6. Pressure Switches: Pressure switches shall have a repetitive accuracy of plus or minus one (1) percent of their operating range and shall withstand up to 150 percent of rated pressure. Sensors shall be diaphragm or bourdon tube. Switch actuation shall be adjustable over the operating pressure range. Switch shall have a snap-action SPDT contact rated for the application. Switch contacts shall be wiping contacts and shall have adjustable differential setting. Differential pressure switches shall be Dwyer 1630 Series with Operating ranges between 0.05 to 12 inches, W.C.
7. Control Relays: Control relay contacts shall be rated for the application, with SPDT contacts, enclosed in a dustproof enclosure. Relays shall have silver cadmium contact with a minimum life span rating of one million operations. All control relays shall have a LED status indicator light.

F. Digital Outputs:

1. The temperature control contractor shall provide equipment for digital outputs as indicated in the point list.
2. All digital outputs will be electrically isolated from the digital controller either by optical isolation or relays.
  - a. When relays are used, transient suppression shall be placed across the coils.
3. All digital outputs will be provided by dry contacts single pole double throw. The contacts will be wired normally open or normally closed as required.
4. Equipment Start/Stop: Equipment on/off control shall use either momentary relays or magnetic latching relays as appropriate for the equipment control starter.

G. Controlled Devices:

1. Dampers: Provide automatic control dampers as indicated, with damper frames not less than formed 13 ga galvanized steel. Maximum damper section size shall be 48"x72" with larger damper installed in sections with appropriate jack shafting. Provide mounting holes for enclosed duct mounting. Provide damper blades not less than formed 16 ga galvanized steel, with maximum blade width of 8". Equip dampers with motors, with proper rating for each application.
  - a. Secure blades to 1/2" diameter zinc-plated axles using zinc-plated hardware. Seal off against spring stainless steel blade bearings. Provide blade bearings of nylon and provide thrust bearings at each end of every blade. Construct blade linkage hardware of zinc-plated steel and brass. Submit leakage and flow characteristic, plus size schedule for controlled dampers.
  - b. Operating Temperature Range: From -20°F to 200°F.
  - c. For standard applications, provide parallel or opposed blade design. For proportional or modulating control applications, provide opposed blade design. For mixing applications, provide parallel blade design. Dampers shall be designed to operate in systems having velocities up to 3,000 FPM and shall have stainless steel seals along top, bottom and sides of frame and butyl rubber seals along each blade. Dampers shall be rated for leakage at less than 10 cfm/sq. ft. of damper area, at differential pressure of 4" w.g. when damper is being held by a torque of 5.0 inch-pounds.
2. Dampers and Valve Motors: Size each motor to operate dampers or valves with sufficient reserve power to provide smooth modulating action or 2-position action as specified.
  - a. Provide permanent split-capacitor or shaded pole type motors with gear trains completely oil-immersed and sealed. Equip spring-return motors, where indicated on drawings or in operational sequence, with integral spiralspring mechanism. Furnish entire spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
  - b. Motors for outdoor locations shall be completely weatherproof, and capable of normal operation at -20°F.
  - c. Actuators may be of the push-pull or rotating type for either modulating or two-positioning control. Actuators shall stroke by a rotating motion of an overload-proof synchronous motor. Control voltage shall be either 24V AC or 0-20V DC as required by the application.

H. Smoke Detectors:

1. Duct Mounted Smoke Detectors: Duct Mounted Smoke Detectors are provided as work of Division 26.

I. Contactors, Relays, and Switches:

1. Electric Contactors: Provide contactors for operating or limit-control of electric heating loads which are UL-listed for 100,000 cycles of resistive loads. Equip with replaceable molded coils and replaceable silver cadmium oxide contacts. Coat core laminations with heat-resistant inorganic firm to reduce core losses. Provide line and load terminals on contactors with higher-than-35-amp rating, or provide one-piece formed-and-welded pressure type. Provide screw-type contactors for 35-amp-or-lower rating. Equip field-mounted contactors with suitable steel enclosures; and provide open-type mounting for those installed in factory-fabricated panels.

2.4 WIRING

A. All devices in the digital temperature control panel or remote shall be final connected under this Section.

B. Wire:

1. General:

a. All power wiring, class 1, 2 or 3 wiring and communications wiring required for satisfactory installation and operations of all equipment required on this project for the section of work specified under temperature control shall be supplied and installed by the Temperature Control Contractor (TCC).

Exception: When specifically specified to be provided by another trade.

All wiring shall be installed in accordance to wiring specifications found in Division 26 and those found in this section.

Note: Should any discrepancy be found between wiring specifications in this Division 23 and Division 26, wiring requirements of Division 23 will prevail for work specified in Division 23.

b. All wiring shall be installed in accordance with all applicable electrical codes and shall comply with equipment manufacturer's recommendations.

Exception: When specifically specified materials or installation methods exceed applicable electrical codes and equipment manufacturer's recommendations.

c. The TCC shall be responsible for all required permits for his work.

d. Provide a commercial telephone connection to the Network/Global controller.

2. Raceway System:

a. All wiring shall be installed in a complete conduit raceway system of a minimum trade size of 1/2 inch. Conduit shall be installed continuous from terminal to terminal and shall be mechanically and electrically connected. The entire system shall be grounded.

b. Conduits passing from the building exterior to interior or passing between conditioned and non-conditioned spaces shall be sealed to prevent condensation in the conduit.

c. Conduits crossing building-expansion joints shall be provided with expansion fittings and flexible grounded bonds by-passing the fittings to insure ground continuity.

3. Wire and Cable

a. All wire shall be copper and meet the minimum wire size and insulation class listed.

Wire Class	Min. Wire Size	Min. Insulation Class
Power	12 Gauge	600 Volt
Class One	14 Gauge	600 Volt
Class Two	18 Gauge Stranded	300 Volt
Class Three	18 Gauge Stranded	300 Volt
Communications	Per Manufacturer	Per Manufacturer

b. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit. Power



- and Class One may not be run together with Class Two and Three or communications.
- c. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per NEC.
  - d. All sensor wiring shall have a 100 percent grounded shield.
  - e. All sensor wiring shall use crimped or soldered connections. Wire nuts are not allowed.
  - f. Conduit, in finished areas, shall be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction.  
Exception: Metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.  
Note: Finished areas include offices, hallways, restrooms, etc.
  - g. Conduit, in non-finished areas where possible, shall be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exposed conduit shall run parallel to or at right angles to the building structure.  
Note: Non-finished areas include equipment rooms; such as HVAC equipment, telephone equipment, batteries, work shops, janitorial closets, etc.  
  
New conduit shall be blue EMT for all low voltage and control wiring.
  - h. Identify all control/signal wires with labeling tape using either words, letters or numbers that can be exactly cross-referenced with as-built drawings.
  - i. Pull spare control cables as noted on drawings.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. The temperature control contractor will supply an approved digital controller complete with all required hardware and software to meet the minimum requirements specified for each of the four areas of performance.
  - 1. Building system control.
  - 2. Alarming/monitoring.
  - 3. Operator interface.
  - 4. Data collection and formatting.
- B. In meeting these performance specifications, the temperature control contractor will provide a total system of a configuration.
  - 1. Compatible with good industry practice.
  - 2. Composed of components meeting minimum hardware quality specified.
  - 3. Compatible with specified system architecture.

#### **3.2 MONITOR/ALARM-INPUT/OUTPUT**

- A. The temperature control contractor will provide both the hardware and software required to monitor points listed in the input/output summary.

- B. Provide software as described in this section completely programmed such that when turned over to the Owner, all alarming functions will be available to the Owner without additional programming.
- C. Upon the input of a simple command, the operator will be able to examine the status or value of any input/output. All analog values examined will be in correct engineering units and all binary inputs/outputs will be indicated as open/closed, on/off, low/high, etc.
- D. Each analog input point will be assigned maximum and minimum operating or expected value. When the sensed variable exceeds the assigned operating range, an alarm will be generated.
- E. The commanded state of each binary output will be compared to the actual state. If these are not the same, an alarm will be generated. Time delays will be provided as required to prevent false alarms.
- F. Alarms shall be classified as either critical or informational.
- G. Critical alarms will output in the following manner.
  - 1. The digital controller will dial out to a designated phone number after being acknowledged by a terminal. A printed alarm message will be sent to the designated terminal giving time, date, location and alarm description. This message shall consist of up to fifty (50) characters.
  - 2. A similar alarm message to that sent off site will appear on the local access terminal.
  - 3. A binary output will energize a light and horn located at the field interface panel. A silence switch shall be provided for the horn. The alarm will only be manually reset. If reset and the silence switch is on, the horn will be activated until the silence switch is returned to its normal position.
- H. Both critical and information alarms will be stored in memory and will be available through an operator command.

### 3.3 OPERATOR INTERFACE

- A. General
  - 1. The temperature control contractor will provide integration with the existing operator interface. Provide updated graphics for new systems and room sensors.

### 3.4 DATA COLLECTION AND FORMATTING

- A. The temperature control contractor will provide both the hardware and software required to provide operator logs.
- B. Provide software as described in this section completely programmed such that when turned over to the Owner, these logs will be available to the Owner without additional programming.
  - 1. Point Summary: Will print out every currently programmed point showing:
    - a. The descriptive name.
    - b. Current analog value or current digital state.

2. Trend Log: Set up a trend log for every input and output point to record, at minimum, the last thirty (30) values. Time intervals shall initially all be set at two (2) minutes; however, they may be user changeable up to one (1) hour.
3. Alarm Log: Set up an alarm log which will print the last thirty (30) alarms giving time, date, description and location.
4. Daily Report: Set up a software program which will be able to initiate any alarm log, trend log, or point summary on a time programmed weekly basis. Allow for up to four (4) reports per day. Preceded report with time and date.

### 3.5 CONTROL STRATEGY

- A. It will be the responsibility of the temperature control contractor to provide the following:
  1. Temperature control programs to accomplish the desired sequence of operation as indicated. These computer programs shall be provided to the Architect/Engineer for approval with the hardware submittals. The responsibility will remain with the temperature control contractor to modify the program to accomplish the desired sequence of operation.
  2. The new digital temperature control panel shall be:
    - a. Completely user programmable and setpoints alterable; user programmable to mean allowing the user to completely alter and/or change operating strategies, program and/or software algorithms, operating programs and setpoints.
- B. The temperature control contractor shall provide the programs or software necessary to implement all sequence of operations, methods, alarm programs, etc., needed in this project.

### 3.6 APPLICATION PROGRAMS: PROVIDE SOFTWARE TO ACCOMPLISH THE FOLLOWING

- A. Perform all functions specified in the I/O summary tables by use of the appropriate application programs.
  1. Program Inputs: Use all of the program inputs specified for each application program to calculate the specified program output(s). Where the specific program inputs are not available (no status indication called for in the I/O summary table), provide a "default" value to place the missing input, thus maintaining the integrity of the algorithm used.
  2. Analog Commands:
    - a. Setpoint Adjustment: using an AO or DO in conjunction with an AI signal from the sensed media, achieve changes in operating setpoints via electric transducers actuators.
    - b. Position Adjustment: Provide position adjustment as specified by using an AO or DO in conjunction with an AI signal from a controlled device to close the control loop.
  3. Analog Monitoring: The system shall measure all analog values specified in the I/O summary tables including calculated analog points, and shall express analog values in proper engineering units with sign.
  4. Data Environment Restart: Provide a DE restart program based on detection of power failure. Upon restoration of power to the DE, restart all equipment and restore all loads to the state at time of power failure or to the state as commanded by time programs or other overriding programs. Provide appropriate time delays to prevent demand surges or overload trips.

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5. Failure Mode: Provide a "watch-dog" timer function for detection of failures. Upon detection of system failure, force all outputs to a predetermined state, consistent with the control device interfacing with the DE.
6. Device Operation: All control devices connected to the system shall have memory resident constraints checked before each command or CPA is issued to insure that no equipment damage will result from improper operation.
7. Time Programs: Time programs shall automatically be initiated based on pre-established time schedules for those items specified. Provide capacity to control on/off and event initiation times for each day of the week (Monday through Sunday). Provide an additional time program(s) for holidays. To eliminate power surges, the system shall enter an adjustable time delay between consecutive start commands generated by the time program for electrical loads over 20 horsepower or 50 kw.
8. Event Programs: Event programs shall be manually or automatically initiated based on events, either hardware or software derived.
9. Scheduled Start/Stop Program: Provide software to start and stop equipment based on the time of day and day of week including holidays. The program shall monitor the controlled equipment status to verify that the start and stop command has been carried out (and provide the system with an alarm when the equipment does not start or stop, fails, or is locally started or stopped). The schedule start/stop program shall operate in conjunction and be coordinated with optimum start/stop, day/night setback, ventilation/recirculation and lighting control programs. The software requirements are:
  - a. Program Inputs:
    - 1) Day of week.
    - 2) Time of day.
    - 3) Summer or winter operation.
    - 4) Equipment constraints.
  - b. Program Outputs:
    - 1) Start signal.
    - 2) Stop signal.
10. Systems Reports: The system shall be capable of outputting reports to a printer. This reporting capability shall be upon operator request or when triggered by pre-programmed events or times as described in the various sequence of operations. All reports from the system whether activated automatically or in response to an operator request shall be preceded by an approved identification scheme followed by the text of report. As a minimum, these reports shall consist of the following:
  - a. Every 3-hour readings of all input and output points in the system during occupied times only. The initial 3-hour time span between all input and output points scans shall be fully changeable/alterable to other time spans by software or program modification. The readings shall be whatever sensed conditions, i.e. temperatures, on/off status, humidity, enthalpy, refrigeration, etc., at each respective points identified in the system. All reporting shall be done automatically without operator assistance.
  - b. History Report: Upon operator request, provide a record of the following:
    - 1) Highest and lowest sensed value from all points over the operating time of the temperature control system.
  - c. Input/Output Reports: Print the value or state of a specified input and/or output and/or group of inputs and/or outputs in standard engineering units as may be applicable. The particular input and/or output shall be fully identified in the report.

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- d. Alarm Reports: Print an english language - based message(s) indicating the occurrence of pre-programmed alarm condition(s). The message(s) shall be fully changeable and/or alterable by software modifications in its entirety. Each alarm message shall consist of a minimum of 50 ASCII characters.
- e. Error Report: Print a historical record of errors encountered in running the required self-test diagnostics and a record of power interruptions.
- f. Over-ride Reports: Print a listing of those inputs and outputs that are currently overridden. The listing shall contain overrides due to use of the output hand-off-auto switches as well as overrides initiated via the operators terminal.
- g. Trace: Print a record of the operation of given control sequence.
- h. System Integrity Tests: The unit shall continuously perform discrete tests to verify the performance of its CPU and memory (both RAM and ROM). These tests shall be performed in background and shall determine whether a fault has occurred. These shall include:
  - 1) Performance checks on the CPU.
  - 2) Correctness of data/programs stored in ROM.
  - 3) Correctness of application programs stored in RAM.
- i. ROM Check: This background test shall validate check sums maintained for each 2K of ROM. If an error is detected, it shall be logged.
- j. RAM Integrity Checks: As each drum control decision is processed, it shall be checked to insure data validity before execution of a control decision. If an error is detected, the condition shall be logged and the line exempted from further processing.

**END OF SECTION 23 09 00**

## **SECTION 23 11 23 – FUEL GAS PIPING**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. This Section includes distribution piping systems for natural gas and manufactured gas within the building and extending from the point of delivery to the connections with gas utilization devices. Piping materials and equipment specified in this section include:
- B. Pipes, fittings, and specialties.
- C. Special duty valves.
- D. This Section does not apply to LP-gas piping; industrial gas applications using such gases as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen and nitrogen; gas piping, meters, gas pressure regulators and other appurtenances used by the serving gas supplier in distribution of gas.
- E. Gas pressures for systems specified in this section are limited to 5 psig.
- F. The requirements of the following Division 23 Sections apply to this Section:
  - 1. Basic Mechanical Materials and Methods.
  - 2. Hangers and Supports.
- G. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 23 Section "Basic Mechanical Materials and Methods" for materials and methods for sealing pipe penetrations through basement walls and fire/smoke barriers.
  - 2. Division 23 Section "Basic Mechanical Materials and Methods" or "Mechanical Identification" for labeling and identification of gas piping systems.

#### **1.2 DEFINITIONS**

- A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).
- B. Gas Distribution Piping: A pipe within the building, which conveys gas from the point of delivery to the points of usage.
- C. Gas Service Piping: The pipe from the gas main or other source of supply including the meter, regulating valve, or service valve to the gas distribution system of the building served.
- D. Point of delivery is the outlet of the service meter assembly, or the outlet of the service regulator (service shutoff valve when no meter is provided).

#### **1.3 SUBMITTALS**

- A. Product data for each gas piping specialty and special duty valve. Include rated capacities of selected models, furnished specialties and accessories, and installation instructions.

- B. Shop drawings detailing dimensions, required clearances, for connection to gas meter.
- C. Coordination drawings for gas distribution piping systems in accordance with Division 23 Section "Basic Mechanical Materials and Methods."
- D. Maintenance data for gas specialties and special duty valves, for inclusion in operating and maintenance manual specified in Division 1 and Division-23 Section "Basic Mechanical Materials and Methods."
- E. Welders' qualification certificates, certifying that welders comply meet the quality requirements specified under "Quality Assurance" below.
- F. Test reports specified in Part 3 below.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installation and replacement of gas piping, gas utilization equipment or accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified is defined as experienced in such work (experienced shall mean having a minimum of 5 previous projects similar in size and scope to this project), familiar with precautions required, and has complied with the requirements of the authority having jurisdiction. Upon request, submit evidence of such qualifications to the Architect.
- B. Qualifications for Welding Processes and Operators: Comply with the requirements of ASME Boiler and Pressure Vessel Code, "Welding and Brazing Qualification."
- C. Regulatory Requirements: Comply with the requirements of the following codes:
  - 1. NFPA 54 - National Fuel Gas Code, for gas piping materials and components, gas piping installations, and inspection, testing, and purging of gas piping systems.
  - 2. Local, City, and State Codes.
  - 3. Local Utility Requirements.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and legally dispose of liquid from drips in existing gas piping and handle cautiously to avoid spillage or ignition. Notify the gas supplier. Handle flammable liquids used by the installer with proper precautions, and do not leave on the premises from the end of one working day to the beginning of the next.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Notification of Interruption of Service: Except in the case of an emergency, notify all affected users when the gas supply is to be turned off.
- B. Work Interruptions: When interruptions in work occur while repairs or alterations are being made to an existing piping system, leave the system in safe condition.
- C. Coordinate the installation of pipe sleeves for foundation wall penetrations.

#### 1.7 EXTRA MATERIALS

- A. Valve Wrenches: Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturer: Subject to compliance with requirements, provide gas piping system products from one of the following:
  - 1. Gas Cocks:
    - a. Jenkins Bros.
    - b. Lunkenheimer Co.
    - c. NIBCO, Inc.
    - d. Powell Co.
    - e. Stockham.

### **2.2 PIPE AND TUBING MATERIALS**

- A. General: All piping shall be Made in the USA
- B. General: Refer to Part 3, Article "PIPE APPLICATION" for identification of systems where the below specified pipe and fitting materials are used.
- C. Steel Pipe: ASTM A53, Schedule 40, continuous welded or seamless, black steel pipe, beveled ends.

### **2.3 FITTINGS**

- A. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
- B. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.
- C. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:
  - 1. Material Group: 1.1.
  - 2. End Connections: Butt Welding.
  - 3. Facings: Raised face.

### **2.4 JOINING MATERIALS**

- A. Joint Compound: suitable for the gas being handled.
- B. Gasket Material: thickness, material, and type suitable for gas to be handled, and for design temperatures and pressures.



2.5 PIPING SPECIALTIES

- A. Unions: ANSI B16.39, Class 150 black malleable iron; female pattern; brass to iron seat; ground joint.
- B. Protective Coating: When piping will be in contact with material or atmosphere exerting a corrosive action, pipe and fittings shall be factory-coated with polyethylene tape, having the following properties:
  - 1. overall thickness; 20 mils.
  - 2. synthetic adhesive.
  - 3. water vapor transmission rate, gallons per 100 square inch: 0.10 or less.
  - 4. water absorption, percent: 0.02 or less.
  - 5. prime pipe and fittings with a compatible primer prior to application of tape.

2.6 VALVES

- A. Gas Cocks 2 Inch and Smaller: 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends.
- B. Gas Cocks 2-1/2 Inch and Larger: MSS SP-78; 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.

2.7 PRESSURE REGULATORS

- A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.
  - 1. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
  - 2. NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
  - 3. Line Pressure Regulators: ANSI Z21.80 with 10-psig inlet pressure rating, unless otherwise indicated.
  - 4. Appliance Pressure Regulators: ANSI Z21.18. Regulator is to include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction and meeting the following requirements:
    - a. Vent limiting device shall include an orifice capable of limiting the release of gas to 5 cubic feet per hour when supplied with medium pressure gas.
    - b. Pressure regulator has an approved gas valve upstream.
    - c. Is installed in a location that communicates with a ventilated area.
    - d. Has the upstream pressure identified with a permanently attached metal tag.
- B. Pressure Regulator Vents: Factory or field-installed, corrosion-resistant screen in opening if not connected to vent piping.

**PART 3 - EXECUTION**

3.1 PREPARATION

- A. Precautions: Before turning off the gas to the premises, or section of piping, turn off all equipment valves. Perform a leakage test as specified in "FIELD QUALITY CONTROL" below, to determine that all equipment is turned off in the piping section to be affected.
- B. Conform with the requirements in NFPA 54, for the prevention of accidental ignition.

### 3.2 PIPE APPLICATIONS

- A. Install steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.

### 3.3 PIPING INSTALLATIONS

- A. General: Conform to the requirements of NFPA 54 - National Fuel Gas Code.
- B. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Design locations and arrangements of piping take into consideration pipe sizing, flow direction, slope of pipe, expansion, and other design considerations. So far as practical, install piping as indicated.
- C. Concealed Locations: Except as specified below, install concealed gas piping in an air-tight conduit constructed of Schedule 40, seamless black steel with welded joints. Vent conduit to the outside and terminate with a screened vent cap.
  - 1. Above-Ceiling Locations: Gas piping may be installed in accessible above-ceiling spaces (subject to the approval of the authority having jurisdiction), whether or not such spaces are used as a plenum. Valves shall not be located in such spaces.
  - 2. Piping In Partitions: Concealed piping shall not be located in solid partitions. Tubing shall not be run inside hollow walls or partitions unless protected against physical damage. This does not apply to tubing passing through walls or partitions.
  - 3. Prohibited Locations: Do not install gas piping in or through a circulating air duct, gas vent, ventilating duct. This does not apply to accessible above-ceiling space specified above.
- D. Install pipe sleeve and seals at foundation and basement wall penetrations, as specified in Division 23 Section "Basic Mechanical Materials and Methods."
- E. Seal pipe penetrations of fire barriers using fire barrier penetration sealers specified in Division-23 Section "Basic Mechanical Materials and Methods".
- F. Drips and Sediment Traps: Install a drip leg at points where condensate may collect, at the outlet of the gas meter, and in a location readily accessible to permit cleaning and emptying. Do not install drips where condensate is likely to freeze.
  - 1. Construct drips and sediment traps using a tee fitting with the bottom outlet plugged or capped. Use a minimum of 3 pipe diameters in length for the drip leg. Use same size pipe for drip leg as the connected pipe.
- G. Use fittings for all changes in direction and all branch connections.
- H. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

- I. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.
- J. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- K. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1" clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.
- L. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- M. Install gas piping at a uniform grade of 1/4 inch in 15 feet, upward to risers, and from the risers to the meter, or service regulator when meter is not provided, or the equipment.
- N. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.
- O. Connect branch outlet pipes from the top or sides of horizontal lines, not from the bottom.
- P. Hanger, supports, and anchors are specified in Division 23 Section "Hangers and Supports." Conform to the table below for maximum spacing of supports:

1. Steel Pipe:

<b>SIZE (NPS)</b>	<b>SPACING IN FEET</b>	<b>MIN. ROD SIZE-INCHES</b>
1/2"	6	3/8
3/4" To 1"	8	3/8
1-1/4" To 3-1/2"	10	1/2
4" & Larger	10	5/8

Support vertical piping at each floor level.

- Q. Install unions in pipes 2 inch and smaller, adjacent to each valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
- R. Install flanges on valves, apparatus, and equipment having 2-1/2 inch and larger connections.
- S. Install strainers on the supply side of each control valve, pressure reducing valve, pressure regulating valve, solenoid valve, and elsewhere as indicated.
- T. Anchor piping to ensure proper direction of expansion and contraction. Install expansion loops and joints as indicated on the Drawings and specified in Division-23 Section "Pipe Expansion Fittings and Loops."

3.4 PIPE JOINT CONSTRUCTION

- A. Welded Joints: Comply with the requirements in ASME Boiler and Pressure Vessel Code, Section IX.
- B. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:

1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Refer to NFPA 54, for guide for number and length of threads for field threading steel pipe.
  2. Align threads at point of assembly.
  3. Apply appropriate tape or thread compound to the external pipe threads.
  4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
  5. Damaged Threads: Do not use pipe with threads which are corroded or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.
- C. Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

### 3.5 VALVE APPLICATIONS

- A. General: The Drawings indicate valve types, locations, and arrangements.
- B. Shut-off duty: Use gas cocks specified in Part 2 above.

### 3.6 VALVE INSTALLATIONS

- A. Install valves in accessible locations, protected from physical damage. Tag valves with a metal tag attached with a metal chain indicating the piping systems supplied.
- B. Install a gas cock upstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve is not required at the second regulator.
- C. Install pressure relief or pressure limiting devices so they can be readily operated to determine if the valve is free; so they can be tested to determine the pressure at which they will operate; and examined for leakage when in the closed position.

### 3.7 TERMINAL EQUIPMENT CONNECTIONS

- A. Install gas cock upstream and within 6 feet of gas appliance. Install a union or flanged connection downstream from the gas cock to permit removal of controls.
- B. Sediment Traps: Install a tee fitting with the bottom outlet plugged or capped as close to the inlet of the gas appliance as practical. Drip leg shall be a minimum of 3 pipe diameters in length.

### 3.8 ELECTRICAL BONDING AND GROUNDING

- A. Install above ground portions of gas piping systems, upstream from equipment shutoff valves electrically continuous and bonded to a grounding electrode in accordance with NFPA 70 - "National Electrical Code."
- B. Do not use gas piping as a grounding electrode.

- C. Conform to NFPA 70 - "National Electrical Code," for electrical connections between wiring and electrically operated control devices.

3.9 FIELD QUALITY CONTROL

- A. Piping Tests: Inspect, test, and purge natural gas systems in accordance with NFPA 54, and local utility requirements.

**END OF SECTION 23 11 23**

## **SECTION 23 51 00 – BREECHINGS, CHIMNEYS AND STACKS**

### **PART 1 - GENERAL**

#### 1.1 WORK INCLUDED

- A. Extent of breechings, chimneys, and stacks work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of breechings, chimneys, and stacks specified in this section include the following:
  - 1. Category IV rated Venting
- C. Refer to other Division-23 fuel burning equipment sections for draft hoods associated with atmospheric fuel-burning equipment.
- D. Refer to other Division-23 sections for insulation of breechings, chimneys, and stacks.
- E. Refer to Section 23 00 00 for equipment certification requirements.

#### 1.2 SUBMITTALS

- A. Product Data: Submit product data including materials, dimensions, weights, and accessories.
- B. Shop Drawings: For vents, breechings, chimneys, and stacks. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Sizing Calculations: Submit sizing calculations prepared by the manufacturer based on the heating equipment to be installed. Sizing calculations shall include flue gas temperature, flow rate and the manufacturers required draft pressure at the outlet of heating equipment.
  - 2. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, methods of field assembly, components, hangers and seismic restraints, and location and size of each field connection.
  - 3. For installed products indicated to comply with design loads, include calculations required for selecting seismic restraints and structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Quality Control Submittals:
  - 1. Certificates: Submit certificates of materials compliance with specified ASTM, UL, and ASHRAE requirements.
  - 2. Certificates: Submit Welders' Qualification Certificates.
  - 3. Certificates: Submit complete engineering report certifying that stacks meet the design wind and seismic loads.

#### 1.3 QUALITY ASSURANCE

- A. Welder's Qualifications: All welders shall be certified in accordance with AWS Standard D9.1, Specifications for Welding Sheet Metal.
- B. Codes and Standards:
  - 1. NFPA: Comply with NFPA 211 "Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances."
  - 2. UL: Comply with applicable portions of UL safety standards; provide products which have been UL listed and labeled.
  - 3. SMACNA: Comply with SMACNA Low Pressure Duct Standards for fabricated breeching and smokepipe.
  - 4. AWS: Comply with AWS Structural Welding Code for welders' qualifications, welding details, and workmanship standards.
  - 5. ASHRAE: Comply with the ASHRAE Equipment Handbook, Chapter 27, for Chimney, Gas Vent, and Fireplace Systems, material requirements and design criteria.

## **PART 2 - PRODUCTS**

### 2.1 LISTED SPECIAL GAS VENT

- A. Manufacturers:
  - 1. Heat-Fab Inc.
  - 2. Metal-Fab, Inc.
  - 3. ProTech Systems Inc.
  - 4. Duravent
- B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480°F continuously, with positive or negative flue pressure complying with NFPA 211 and suitable for condensing-gas appliances.
- C. Construction: Inner shell and outer jacket separated by at least a 1/2-inch airspace.
- D. Inner Shell: ASTM A 959, Type AL29-4C stainless steel.
- E. Outer Jacket: Stainless steel.
- F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
  - 1. Termination: Manufacturer's concentric vent kit.

### 2.2 LISTED POLYPROPYLENE

- A. Manufacturers:
  - 1. DURAVENT.
  - 2. CENTROTERM

- B. Description: Polypropylene vents tested according to UL 1738 with positive or negative flue pressure complying with NFPA 211 and suitable for condensing-gas appliances.
- C. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
  - 1. Termination: Manufacturer's concentric vent kit.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF LISTED VENTS AND CHIMNEYS**

- A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
- B. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
- D. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.
- E. Connect base section to foundation using anchor lugs of size and number recommended by manufacturer.
- F. Join sections with acid-resistant joint cement to provide continuous joint and smooth interior finish.
- G. Erect stacks plumb to finished tolerance of no more than 1 out of plumb from top to bottom.

#### **3.2 ADJUSTING AND CLEANING**

- A. Clean breechings internally during installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth.

#### **3.3 PROTECTION**

- A. Temporary Closure: At ends of breechings and chimneys which are not completed or connected to equipment, provide temporary closure which will prevent entrance of dust and debris until installations are completed.

**END OF SECTION 23 51 00**



## **SECTION 26 00 10 - GENERAL ELECTRICAL**

### **PART 1 - GENERAL.**

#### 1.1 RESPONSIBILITIES

- A. The Bidding Requirements, Conditions of Contract, General Specifications and General Requirements, and this specification shall be binding on the Contractor and shall apply to all electrical work to be completed under Division 26, 27 and 28.
- B. The Contractor shall be responsible for the work from the date of this contract until its acceptance by the Owner and must repair all damages sustained from whatever cause. The contractor shall use proper care and diligence in bracing and securing all parts of the work and shall in all cases judge as to the amount of protection required.

#### 1.2 ORDINANCES, LAWS AND CODES

- A. All work shall conform to the rules and regulations of the National Electrical Code, Local Codes, Occupational Safety and Health Act and the Local Fire Marshall's Office. All certificates of approval shall be delivered to the Engineer before final payment will be made.
- B. Should any change in the drawings and/or specifications be required to conform to the above mentioned laws and ordinances, the Engineer shall be notified by the Bidder prior to the bid date, so that the necessary changes may be completed. After the bid date, all work necessary to meet the requirements shall be at the Contractor's expense with no additional cost to the Owner.
- C. The Contractor shall pay for all fees, permits, taxes, inspections, connections, etc., associated with the electrical work under this contract. Any costs, charges, or connection fees which are required to obtain permanent and temporary electrical service to the project facility will be paid by the Contractor as part of this contract.

#### 1.3 DATA AND MEASUREMENT

- A. The data given herein and on the drawings is as exact as could be secured insofar as building construction and existing conditions are concerned. Extreme accuracy is not guaranteed. The drawings and specifications are intended for the assistance of the Contractor in achieving the end result. Exact locations, measurements, distance, levels, etc., will be governed by conditions at the job site.
- B. The Contractor shall verify that the size of the equipment supplied by the selected manufacturers does not exceed the available mounting space.
- C. The Engineer reserves the right to change location or size of conduits, outlets, fixtures or other pieces of equipment as may be necessary to avoid conflicts. No extra compensation will be allowed for such changes unless additional cost to the Contractor is caused.
- D. It is strongly recommended that the bidders visit the project site so that they may have knowledge of conditions at the job site and adapt their bids and work to such conditions.

1.4 DRAWINGS AND SPECIFICATIONS

- A. Anything mentioned in this specification and not shown on the drawings, or vice versa, shall be of like effect, as shown or mentioned in both. In any case of discrepancy or differences in the figures, drawings or specifications, the Bidder shall promptly report such discrepancies to the Engineer who shall make a decision in writing. Any adjustment by the Contractor without this decision shall be at the expense of the Contractor.

1.5 QUALITY OF WORKMANSHIP

- A. The Contractor shall give his personal superintendence and direction to the work. He shall also keep a competent foreman or superintendent on the project at all times.
- B. All equipment, controls and junction boxes shall be located for ready access, operation, repair and maintenance.
- C. Any additional drawings necessary for the prosecution of the work will be furnished by the Engineer as promptly as possible. The Contractor shall request any additional instructions needed and shall do no work without drawings and instructions.
- D. Any discrepancies between the mechanical and electrical drawings shall be reported to the Engineer prior to the Bid Date.

1.6 GUARANTEE

- A. The Contractor shall guarantee all materials, workmanship and the successful operation of all apparatus furnished and installed by him for a period of one year from the date of the final acceptance of the whole work, and shall guarantee to repair or replace at his own expense any part of the apparatus which may show defect during that time, provided such defect is, in the opinion of the Engineer due to imperfect material or workmanship and not to carelessness or improper operation. Guarantee period for the replacement shall begin with the date of replacement.
- B. The Owner shall notify the Contractor of any failure of any part or parts which occur during the guarantee period.
- C. The Contractor shall also guarantee the systems and the apparatus to be working properly to meet all conditions as specified.

1.7 SHOP DRAWINGS

- A. Shop drawings, catalog sheets and manufacturer's data shall be submitted in accordance with the requirements of Paragraph "Shop Drawings" of the General Conditions. On or before thirty days after award of contract; the Contractor shall submit six copies of all fabricated work and equipment to be purchased. Data shall be sufficiently completed to permit evaluation and comparison with specified equipment and material. Refer to the table at the end of this section for a summary of the requirements. The table is not project specific and may indicate submittals that are not required for this project. Refer to the individual specification sections for the required submittals.
- B. All drawings shall bear the Contractor's stamp of approval and must be dated.
- C. Shop drawings and/or catalog and data sheets shall include, but not be limited to the following:
  - 1. Disconnect Switches

2. Branch Circuit Breakers
3. Boxes and Devices
4. Fuses and Overloads
5. Identification & Plaques

- D. A notation shall be made on each item submitted as to its specified use or description of specific location in the work.
- E. None of the preceding items shall be purchased, delivered to the site or installed until the item has been properly submitted in writing and reviewed by the Engineer.
- F. Submittals shall be made even though the item is exactly as specified.
- G. Should the Contractor fail to comply with any of the requirements as stated, the Engineer reserves the right to select a full line of materials, appliances, and equipment which shall be final and binding upon the Contractor.

#### 1.8 SUBMITTAL DATA

- A. Review of submittal data is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions that shall be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of his work with that of all other trades and the satisfactory performance of his work.
- B. Contractor will be limited to one review on a singular piece of equipment.
- C. The listing of a manufacturer as "acceptable" does not imply automatic compliance with contract documents. It is the sole responsibility of the Contractor to insure that any price quotations received and submittals made are for equipment/systems which meet or exceed the specifications included herein.

#### 1.9 EQUAL MANUFACTURERS/EQUIPMENT

- A. Any approval requests for manufacturer/equipment to be considered as equal other than as specified herein and on the drawings shall be submitted to the Engineer not less than 10 days prior to bid date.
- B. Requests for review shall be sufficiently complete to permit evaluation and comparison with specified equipment and material.
- C. Requests for substitutions shall be accompanied by a written comparison between the specified item and the substituted item. Request submittals shall be accompanied by complete technical data, including laboratory reports, if applicable on the proposed product. Each item proposed for substitution shall be clearly identified. Explain fully the differences, if any, between the proposed product and the products named in the Specifications. Failure to provide the above information may result in the rejection of the submittal.
- D. Only one request for substitution for each product will be considered. If the substitution is not accepted, provide specified product.

- E. If at any time during the project it is determined that a product has been misrepresented as an equal to a specified product. The contractor shall be required to replace the product at their expense. This stipulation applies even if the engineer has provided his/her stamp of approval.

1.10 SCHEDULE OF VALUES

- A. Schedule of values shall be submitted within 30 days after award of contract or as specified in Division 1 or General Conditions of contract.
- B. The schedule of values shall be broken down by individual specification section and shall delineate materials and labor. Specific cost breakdown information provided to the engineer will be held in confidence.

**PART 2 - PRODUCTS**

2.1 PROTECTION OF FIXTURES AND WARES

- A. The Contractor shall apply the necessary protective coverage to fixtures and other equipment to prevent scratches and mars to such equipment.

2.2 STORAGE

- A. The Contractor shall provide and be responsible for safe storage of his materials and such storage shall not interfere with the work of others or progress of the project in any manner.

2.3 EQUIPMENT ENCLOSURES

- A. Provide enclosures that mate properly with the equipment to be enclosed and are NEMA rated to suit the atmospheric conditions of the equipment surroundings.
- B. Equipment in a corrosive atmosphere shall be rated NEMA 4X. All NEMA 4X equipment shall be fabricated from suitable non-metallic material or shall be stainless steel. Painted steel is not acceptable for NEMA 4X applications.

2.4 PAINTING (Refer to painting specification for appropriate preparation and materials)

- A. All exposed conduit, boxes, mounting hardware, etc. in rooms to be painted shall be painted to match the surrounding surface. Exposed conduit, boxes, mounting hardware, etc. installed in rooms that are not painted may be left un-painted. Unless otherwise noted, prior approval must be obtained before mounting exposed conduit, boxes, etc.
- B. All exposed conduit, boxes, covers, enclosures, etc. on the exterior of the building must be painted to match the surrounding surfaces. Unless otherwise noted, prior approval must be obtained before mounting exposed conduit, boxes, etc.

### **PART 3 - EXECUTION**

#### **3.1 COORDINATION**

- A. Before installing any work, the Contractor shall coordinate the electrical work with all other contractors on the project, with the owner's representative, with the electric utility company and the State Code enforcing department.
- B. All electrical work shall be installed in proper sequence and so arranged with other trades that there will be no delay in the proper installation and completion of any part or parts of all piping systems and mechanical equipment.
- C. The Contractor shall carefully examine the drawings and shall be responsible for the proper fitting of equipment and conduit as indicated without major alteration. If alterations are required, a detailed drawing of the proposed departure due to actual field conditions or other causes shall be submitted to the Engineer for approval.
- D. Whenever interferences might occur, before installing any of the work in question, the Electrical Contractor shall consult with other contractors and shall come to an agreement with them as to the exact location and level of his conduit, light fixtures, and/or parts of his installation.
- E. When low voltage cabling is required to penetrate through a fire rated partition and the cabling is not installed in a sealed metallic conveyance, provide an approved fire rated "Thru-Wall Fitting" such as the Wiremold Flame Stopper Series unit.
- F. All changes in the work of the Contractor, caused by their neglect to follow these instructions, shall be made at this Contractor's expense.

#### **3.2 EQUIPMENT CONNECTIONS**

- A. Coordinate and provide the hook up of the following equipment with the Contractor required to furnish and install them. See the appropriate sections in the General Construction Work specifications for further information.
  - 1. Mechanical Equipment
- B. Verify fuse or circuit breaker requirements for electrical connections to equipment and provide overcurrent devices accordingly.

#### **3.3 WORK IN EXISTING BUILDING**

- A. Inasmuch as work under this contract includes adding to the existing building, it shall be the responsibility of each bidder to fully inform themselves of any and all conditions which influence or are influenced by work contemplated by these specifications and accompanying drawings. The submission of a proposal by any bidder will be construed as an admission by them that they have examined and are fully familiar with the premises and all conditions thereon and adjacent thereto, and has included in this proposal a proper and adequate amount to cover rearrangement of old work for the proper installation and operation of the new and existing equipment as shown on the drawings specified herein, or as required. Such work shall be neatly and properly done.
- B. Maintain existing electrical service and feeders to occupied areas and operational facilities, unless otherwise indicated, or when authorized otherwise in writing by Owner. Provide temporary service during interruptions to existing facilities. When necessary, schedule

momentary outages for equipment replacement and the system cut-overs. When the "cutting-over" has been successfully accomplished, remove, relocate, or abandon existing wiring as indicated.

- C. The operation of all special systems within the building shall be maintained, including but not limited to; fire alarm, telephone, intercom, data communications, security, emergency call, etc. Provide temporary connections and/or equipment as required to maintain operations during construction. Anticipated momentary outages in any system must be scheduled with the owner before starting work.

#### 3.4 DEMOLITION AND REMOVAL OF EXISTING EQUIPMENT AND MATERIALS

- A. Existing conduits may, at the Contractor's option, be removed, or reused if in good condition.
- B. Conduits may not be abandoned in place in unfinished and accessible areas. Conduits may be abandoned in place when concealed in walls, floors and/or above hard ceilings.
- C. All conduits to be reused shall be thoroughly tested and checked for continuity.
- D. Electrical items must be removed where they interfere with or are not concealed by new construction such as new ceilings, walls, etc.
- E. Existing fixtures, outlets, receptacles and other equipment and material shall be relocated, removed, reconnected or left in place as indicated on the drawings. Where an existing device is shown removed from an existing circuit, new wiring shall be provided as required to insure continuity of existing circuit. If existing devices or other electrical items, such as electrically operated equipment interfere with the location of a new partition, relocation of existing equipment, new equipment, etc., the existing items including electrical components of electrically operated equipment shall be disconnected and removed or satisfactorily relocated and reconnected even though not specifically indicated on the drawings. All material removed which is considered salvageable by the Owner and is not specifically designated to be reused on the drawings or not practical to be reused shall remain in the property of the Owner and shall be neatly stockpiled in a specially designated location.

#### 3.5 CLEANING

- A. The Contractor shall at all times keep the premises free of waste, surplus materials, rubbish, and debris which are caused by the electrical crew or resulting from their work.
- B. After all equipment and fixtures have been installed and building is ready for occupancy, the Electrical Contractor shall remove all stickers, rust stains, labels, temporary covers, plaster marks, paint spots, etc. on new electrical equipment. All foreign matter shall be blown out or flushed out of all conduits, panels, motors, devices, switches, fixtures, etc.
- C. Identification plates and trims on all equipment shall be free of paint and polished.
- D. The Contractor shall leave the electrical portion of the work in a safe, clean and very neat condition ready for operation.

#### 3.6 RECORD DRAWINGS

- A. The Contractor shall maintain an up-to-date set of plans and specifications on the job site. He shall annotate all field changes, addendums, change orders, etc. on this set and see that a copy of all changes is furnished to the Engineer at the end of the project for review.

- B. The drawings shall also include as-built conditions such as equipment and device locations, routing of service entrance and major feeders, branch circuit changes, final panelboard schedules, etc.

### 3.7 INSTRUCTION IN OPERATION BOOKS AND SPARE PARTS

- A. After all tests and adjustments have been made, the Contractor shall furnish the necessary qualified personnel to place the special systems in continuous operation, during which time they shall provide complete operating and maintenance instructions to the Owner's representative with an outline of instructions in written form. These personnel shall reserve adequate time to instruct an Owner's representative on proper operation (including all phases of the system and each of its component parts).
- B. Contractor shall furnish Owner with three sets of all operating instructions, maintenance instruction and spare parts lists of all equipment furnished under this contract. Lists shall include current unit prices and sources of supply for each item of operable equipment.

### 3.8 TESTS AND ADJUSTMENTS

- A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.
- B. During the progress and after completion of the work included under this specification, the Contractor shall make all required tests at his own expense in the presence of the Engineer as required hereinafter and by local ordinances, codes, laws, and regulations. Such tests shall be in accordance with other sections of this division. The Owner's representative shall be notified five days in advance as to the time when such tests are to be performed that a representative of the Engineer may be present.

ELECTRICAL SUBMITTAL REQUIREMENTS

SECTION	ITEM	SUBMITTAL TYPE						
		PD	SD	OM	CA	WC	TR	O
26 00 10	Panelboard Circuit Breakers, Disconnect Switches	X						
26 00 10	Boxes and Devices	X						
26 00 10	Fuses and Overloads	X						
26 00 10	Identification and Plaques	X						
26 00 10	Product Substitutions *	X	X					
26 00 10	Schedule of Values							X
26 00 10	Record Drawings		X					
26 00 10	Operations and Maintenance Manuals			X				
26 08 05	Test Reports						X	

Abbreviations:

- PD: Product Data
- SD: Shop Drawings
- OM: Operation & Maintenance Manuals
- CA: Calculations
- WC: Welding Certificates
- TR: Test Reports
- O: Other
- \*: Required Prior to Bid Opening

END OF SECTION 26 00 10



## **SECTION 26 05 19 - LOW VOLTAGE POWER CONDUCTORS AND CABLES**

### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. Extent of electrical wire and cable work is indicated by drawings and schedules.
- B. Types of electrical wire, cable, and connectors specified in this section include the following:
  - 1. Copper conductors.
  - 2. Tap type connectors.
  - 3. Compression type connectors.
  - 4. Wire nut connectors.

### **PART 2 - PRODUCTS**

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements of this specification.

#### 2.2 WIRES AND CABLES

- A. General: All references to size in these specifications or on drawings is for copper conductors (THHN/THWN). Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for application indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20°C (68°F).
- B. Aluminum conductors may not be provided in lieu of copper conductors.
- C. Building Wires: Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by Installer to comply with project's installation requirements, NEC, and NEMA standards.
- D. Cables: Provide UL-type factory-fabricated cables of sizes, ampacity ratings, materials and jacketing/sheathing as indicated for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements, NEC and NEMA standards.

#### 2.3 MC CABLE

- A. The use of MC cable is not permitted

#### 2.4 CONNECTORS

- A. General: Provide UL-type factory-fabricated, metal connectors of sizes, ampacity ratings, materials, types, and classes for applications and for services indicated. Where not indicated,

provide proper selection as determined by Installer to comply with project's installation requirements, NEC, and NEMA standards.

- B. Compression type connectors: Compression connections shall be the type requiring hydraulic compression tools operating at a minimum pressure of 7000psi with an output pressure of no less than 10 tons.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF WIRES AND CABLES**

- A. General: Install electrical cables, wires, and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, UL, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Unless specifically indicated otherwise, all low voltage cabling shall be installed in conduit. When indicated the low voltage cabling may be routed exposed above accessible ceilings. Prior approval is required prior to installing any exposed low voltage cabling.
- C. The minimum size shall be 12 AWG. All wire No. 10 and smaller to be solid, all No. 8 and larger shall be stranded.
- D. All feeder and branch circuit wiring shall be type THHN/THWN.
- E. Pull conductors simultaneously where more than one is being installed in the same raceway.
- F. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Use of soap will not be permitted as pulling lubricant.
- G. Insulation on conductors shall be permanently marked with wire size, insulation type, voltage range, and manufacturer's name. The insulation on conductors shall be color coded to match the color scheme used in the building.
- H. The phase conductors shall be tagged and shall remain the same throughout the circuit.
- I. Exceptions to the color coding as listed above shall be as follows:
  - 1. Wiring for special systems shall be color coded or labeled as required by the manufacturer.
- J. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips that will not damage cables or raceway.
- K. Install exposed cable, parallel and perpendicular to surfaces, or exposed structural members, and follow surface contours, where possible. Prior approval is required for all exposed cabling.
- L. Keep conductor splices to a minimum.
- M. Install splices and taps that possess equivalent-or-better mechanical strength and insulation ratings than conductors being spliced.
- N. Use splice and tap connectors that are compatible with conductor material.

- O. All splices and taps shall be made in outlet, junction, and pull boxes. Splices on circuit wiring shall be of the pigtail type using solderless connectors. Larger sizes of conductors requiring un-insulated connectors of the bolt type shall be taped with pressure sensitive vinyl tape.
- P. For branch circuit wiring, conductor fill per conduit run shall not contain more than eight current carrying wires. Conduits containing both circuit switch legs and/or traveler wires may contain more than the number stated above, providing the conduit is of adequate size and the wire size is de-rated as required by the National Electrical Code. Whenever a 120V, single-phase branch circuit is over 70 feet in length, or a 277V, single-phase branch circuit is over 150 feet, and the load is in excess of 50 percent of the branch circuit protective device, the conductors shall be increased one size to the first outlet box unless specifically noted otherwise. For special systems, conductor fill of conduit is per manufacturer's specifications furnished with each system, noted on the drawings or shall be as required by code.
- Q. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std. 486A and B.
- R. On occasion, the Contractor might have to route branch circuits in a non-direct path to the equipment/device to avoid unforeseen obstacles. The contractor shall evaluate and upgrade these branch circuits (either low voltage or 600V) as needed to minimize voltage drop. The maximum allowable voltage drop for branch circuits is 3% and a total of 5% for both feeders and branch circuits combined.
- S. Multi-wire branch circuits as defined by the National Electrical code (circuits with common neutral) shall not be used. Exception: Where an equipment manufacturer requires a multi-wire branch circuit for only one piece of utilization equipment and where all ungrounded conductors of that circuit are opened simultaneously by the branch circuit over-current device.

### 3.2 FIELD QUALITY CONTROL

- A. Prior to energization of circuitry, check installed wires and cables with megaohm meter to determine insulation resistance levels to ensure requirements are fulfilled.
- B. Prior to energization, test wires and cables for electrical continuity and for short-circuits.
- C. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

### 3.3 ABANDONED WIRING

- A. All existing wiring and cabling left unused as a result of this project shall be removed and disposed of. In the case of cabling, all associated fastening systems such as wire staples, tie-wraps, electrical tape, etc. shall also be removed. All wiring/conductors in unused conveyances shall be removed. The conveyances may or may not require removal. Refer to the drawings and other specification sections for direction regarding unused conveyances.

END OF SECTION 26 05 19

## **SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. Extent of grounding work is indicated by drawings, schedules and as specified herein.
- B. Types of grounding specified in this section include the following:
  - 1. Solid grounding
- C. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

### **PART 2 - PRODUCTS**

#### 2.1 GROUNDING SYSTEMS

- A. Materials and Components:
  - 1. General: Except as otherwise indicated, provide electrical grounding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, crimp type lugs, compression type lugs, grounding rods/electrodes, bonding jumper braids and additional accessories needed for complete installation. Where more than one type of unit meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE, and established industry standards for applications indicated.
  - 2. Provide a green grounding conductor with each feeder and branch circuit sized per NEC.
- B. Conductors: Provide copper electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC. All conduits shall contain a minimum of one separate equipment grounding conductor identified and sized according to NEC.
- C. Bonding Jumper Braids: Copper braided tape, constructed of 30-gage bare copper wires and properly sized for indicated applications.
- D. Connectors, Terminals and Clamps: Provide electrical connectors, terminals, lugs and clamps as recommended by connector, terminal and clamp manufacturers for indicated applications.
- E. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type of services indicated.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION**

- A. Installer must examine areas and conditions under which electrical grounding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to owner's representative.

#### **3.2 INSTALLATION OF ELECTRICAL GROUNDING**

- A. General: Install electrical grounding systems where shown, in accordance with applicable portions of NEC, with NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements and serve intended functions.
- B. The equipment grounding conductor shall be connected directly to the equipment grounding screw provided on receptacles.
- C. At switch outlets, where self-grounding type switches are installed in metal boxes, the equipment grounding conductor shall be connected directly to the metal box.
- D. Where switches installed in non-metallic boxes have metallic cover plates or screws, provide switches with green hexagonal equipment ground screw and connect to the equipment grounding conductor.
- E. Coordinate with other electrical work as necessary to interface installation of electrical grounding system with other work.
- F. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces to ensure electrical conductivity and circuit integrity.

#### **3.3 FIELD QUALITY CONTROL**

- A. Upon completion of installation of electrical grounding systems, test ground resistance with ground resistance tester. Where tests show resistance to ground is over 10 ohms, take appropriate action to reduce resistance to 10 ohms, or less. Coordinate any rework required with the engineer prior to beginning work.

END OF SECTION 26 05 26

## **SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.
  - 1. Refer to other Division 26 sections for additional specific support requirements that may be applicable to specific items.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements of this specification.

#### 2.2 COATINGS

- A. Coatings: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

#### 2.3 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:
  - 1. Expansion Anchors: Lead, carbon steel wedge or sleeve type. Plastic expansion anchors (for conduit 1" and smaller only).
  - 2. Toggle Bolts: All steel springhead type.
  - 3. Power-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.

- E. U-Channel Systems: 16-gage steel channels, with 9/16-inch diameter holes, at a minimum of 8 inches on center in top surface. Provide fittings and accessories that mate and match the U-channel and are of the same manufacture.

## 2.4 FABRICATED SUPPORTING DEVICES

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
  - 1. Sheet Metal: Fabricate from galvanized sheet metal: round tube closed with snap lock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
    - a. 3 inch and smaller: 20-gage.
    - b. 4 inch to 6-inch: 16-gage.
    - c. Over 6 inch: 14-gage.
  - 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installations.
- C. Raceway Supports: Comply with the NEC and the following requirements:
  - 1. Conform to manufacturer's recommendations for selection and installation of supports.
  - 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
  - 3. Install individual and multiple (trapeze) raceways hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
  - 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
  - 5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
  - 6. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or thread-less box connectors.

7. In vertical runs, arrange supports so that loads produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. Support sheet metal boxes directly from the building structure or by bar hangers.
- G. Sleeves: Install in concrete slabs and walls and all other fire rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL-listed fire stopping sealant in gaps between sleeves and enclosed conduits and cables.
- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seals.
- I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
  1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
  2. Holes cut to depths of more than 1-1/2 inches in reinforced concrete beams or to depths of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
  3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration and shock-resistant fasteners for attachments to concrete slabs.

END OF SECTION 26 05 29



## **SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. All wiring shall be installed in continuous raceways as specified herein except where specifically noted otherwise.
- B. The extent of electrical box and associated fitting work is indicated by drawings and schedules and shall comply with the latest requirements of the NEC.
- C. Types of raceways in this section include the following:
  - 1. Electrical metallic tubing.
  - 2. Flexible metal conduit.
  - 3. Liquid-tight flexible metal conduit.
- D. Types of electrical boxes and fittings in this section include the following:
  - 1. Outlet boxes.
  - 2. Junction boxes.
  - 3. Pull boxes.
  - 4. Bushings.
  - 5. Lock nuts.
  - 6. Knockout closures.

### **PART 2 - PRODUCTS**

#### 2.1 METAL CONDUIT AND TUBING

- A. General: Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, and comply with applicable portions of NEC for raceways.
- B. Flexible Metal Conduit: Provide flexible metal conduit conforming to FS WW-C-566 and UL 1. Formed from continuous lengths of spirally wound, interlocked zinc-coated strip steel.
  - 1. Flexible Metal Conduit Fittings: Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type.
    - a. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.
    - b. 45° or 90° Terminal Angle Connectors: Two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

- C. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit; construct of single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coat with liquid-tight jacket of flexible polyvinyl chloride (PVC).
  - 1. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated throat.
- D. Electrical Metallic Tubing (EMT): Provide electrical metallic tubing conforming to FS WW-C-563, ANSI C80.3 and UL 797.
  - 1. EMT Fittings: Fittings for EMT shall be steel and may be of the screw or compression type. All EMT connectors shall be of the insulated throat type. Cast or indenter fittings are not acceptable.
- E. Conduit Bodies: Provide galvanized cast-metal conduit bodies of types, shapes, and sizes as required to fulfill the job requirements and NEC requirements. Construct conduit bodies with threaded-conduit-entrance ends, removable covers, either cast or of galvanized steel, and corrosion-resistant screws.

## 2.2 BOXES

- A. Outlet Boxes: Conform to UL 514A, "Metallic Outlet Boxes, Electrical," and UL 514B, "Fittings for Conduit and Outlet Boxes." Boxes shall be of type, shape, size, and depth to suit each location and application.
  - 1. Conform to NEMA OS 1, "Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports." Boxes shall be sheet steel with stamped knockouts, threaded screw holes and accessories suitable for each location including mounting brackets and straps, cable clamps, exterior rings and fixture studs.
- B. Rain-tight Outlet Boxes: Provide corrosion-resistant cast-metal rain-tight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring-hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.
- C. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.
- D. Bushings, Knockout Closures and Lock nuts: Provide corrosion-resistant box knockout closures, conduit lock nuts and conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION OF RACEWAYS

- A. General: Install raceways as indicated; in accordance with manufacturer's written installation instructions, and in compliance with NEC, and NECA's "Standards of Installation". Install units plumb and level, and maintain manufacturer's recommended clearances.

- B. Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.

### 3.2 INSTALLATION OF CONDUITS

- A. General: All conduits shall be concealed unless noted otherwise. Install concealed conduits either in walls (stud walls, masonry walls, precast walls, etc.), slabs, or above hung/suspended ceilings. In existing work where conduits cannot be concealed in finished areas, surface metal raceways shall be used, but prior approval is required.
  - 1. Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings and cabinets to provide electrical continuity and firm mechanical assembly.
  - 2. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.
  - 3. Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansion fittings in raceways every 200' of linear run or wherever structural expansion joints are crossed.
  - 4. Use roughing-in dimensions of electrically operated unit furnished by supplier. Set conduit and boxes for connection to units only after receiving review of dimensions and after checking location with other trades.
- B. Conduit Installation:
  - 1. Use liquid-tight flexible conduit in movable partitions and in systems furniture connections. Use flexible metal conduit from lighting junction boxes to recessed lighting fixtures above accessible ceilings. Use liquid-tight flexible metal conduit for the final 24" of connection to motors, or control items subject to movement or vibration.
  - 2. Use liquid-tight flexible conduit where subjected to one or more of the following conditions:
    - a. Exterior location.
    - b. Moist or humid atmosphere where condensate can be expected to accumulate.
    - c. Pump motors.
    - d. Subjected to water spray or dripping oil, water or grease.
- C. Install pull wires in empty raceways. Use no. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
- D. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean. Use temporary closures to prevent foreign matter from entering raceways.
- E. Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
- F. Size conduits to meet NEC requirements and as shown on drawings or specified herein, except no conduit smaller than 3/4 inch shall be embedded in or below concrete or in masonry walls.
- G. Fasten rigid conduit terminations in sheet metal enclosures with locknuts inside and outside enclosure or with threadless rigid box connectors and terminate with bushing.

- H. Conduit terminations in wet locations shall be of the threaded hub type or other sealing type fittings UL listed for use in wet locations.
- I. Conduits are not to cross vertical or horizontal openings such as pipe shafts, elevator shafts, ventilating duct openings, etc.
- J. Keep conduits a minimum distance of 6" from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.
- K. Conduit shall be properly supported as specified herein and as required by NEC.
- L. Support riser conduit at each floor level with clamp hangers.
- M. Use of running threads at conduit joints and terminations is prohibited. Where required, use 3-piece union or split coupling.
- N. Complete installation of electrical raceways before starting installation of cables/wires within raceways.
- O. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
  - 1. Where conduits enter or leave hazardous locations.
  - 2. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
  - 3. Where required by the NEC.
- P. Openings around electrical penetrations through fire-resistant-rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods to maintain the fire resistance rating.
- Q. Provide sleeves for conduits passing through foundation or other load bearing walls.
- R. Concealed Conduits:
  - 1. Conduits in finished areas shall be installed concealed.
  - 2. Metallic raceways installed underground or in floors below grade, or outside are to have conduit threads painted with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure water tightness.
  - 3. For floors-on-grade, install conduits under concrete slabs.
  - 4. Install underground conduits minimum of 24" below finished grade.
  - 5. Rigid steel conduit buried in direct contact with the earth shall be taped with an approved pipeline tape or coated with an asphaltum base paint prior to installation. All scratches shall be re-taped or repainted after installation before backfilling. Tape shall overlap a minimum of 1/4" and shall be two layers thick.
- S. Install conduits as not to damage or run through structural members. Avoid horizontal or cross runs in building partitions or side walls.
- T. Exposed Conduits:

1. In unfinished areas such as janitor closets, storage, mechanical equipment rooms, etc., conduit may be exposed. Prior permission shall be first obtained from the Architect. All exposed conduit shall be installed in a neat manner following the building lines. Horizontal runs shall be close to the ceiling and shall be installed above mechanical piping as much as possible. Single hung conduits shall be supported with strap or rod hangers, wire is not an acceptable hanger. Multiple hung conduits shall be strapped to the channel to hold it in place.
2. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of building.
3. Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.
4. Support exposed conduits by use of hangers, clamps, or clips. Support conduits on each side of bends and on spacing not to exceed the following: up to 1": 6'-0"; 1-1/4" and over: 8'-0".
5. Above requirements for exposed conduits also apply to conduits installed in space above hung ceilings, and in crawl spaces except that spacing of supports for conduits up to 1" shall not exceed 8'-0".

U. Conduit Fittings:

1. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.
2. Plastic insulating bushings for terminating rigid conduits smaller than 1-1/4" are to have ribbed sides with smooth upper edges to prevent injury to cable insulation.
3. Install metallic insulated type bushings for terminating rigid conduits 1-1/4" and larger. Bushings are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing.
4. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs to be specifically designed for their particular application.

### 3.3 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

- A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Surface mounted device boxes in unfinished areas shall be a minimum of 4 inches square, knockout type. Surface mounted boxes in finished and exterior areas, shall be cast metal, threaded hub similar to Bell boxes.
- C. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
- D. Provide weather-tight outlets for interior and exterior locations exposed to weather or moisture.
- E. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- F. Install electrical boxes in those locations that insure ready accessibility to enclosed electrical wiring. Junction boxes shall not be installed above non-accessible ceilings.
- G. Avoid installing boxes back-to-back in walls. Provide not less than 24" separation.
- H. Position recessed outlet boxes accurately to allow for surface finish thickness.

- I. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surfaces.
- J. Fasten electrical boxes firmly and rigidly to substrates, structural surfaces or solidly embed electrical boxes in concrete or masonry. Box support shall be independent of conduit.
- K. Provide electrical connections for installed boxes.
- L. Subsequent to installation of boxes, protect boxes from construction debris and damage.

3.4 GROUNDING

- A. Upon completion of installation work, ground electrical boxes as required by NEC and other Division-26 sections.

END OF SECTION 26 05 33

## **SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. Types of electrical identification specified in this section include the following:
1. Electrical power and control conductors
  2. Operational instructions and warnings
  3. Equipment/system identification signs

### **PART 2 - PRODUCTS**

#### 2.1 ELECTRICAL IDENTIFICATION MATERIALS

- A. Engraved Plastic-Laminate Signs:
1. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black face and white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
    - a. Thickness: 1/16", for units up to 20 sq. in. or 8" length; 1/8" for larger units.
    - b. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

#### 2.2 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations and other designations used in electrical identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.

### **PART 3 - EXECUTION**

#### 3.1 APPLICATION AND INSTALLATION

- A. General Installation Requirements:
1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of NEC.
  2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
  3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

B. Operational Identification and Warnings:

1. General: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

C. Equipment/System Identification:

1. General: Install engraved plastic-laminate plaque for disconnect switches, motor starters, contactors, and similar equipment shall indicate the equipment ID, serving Panel & circuit ID, and the load it serves. Signs for distribution gear, panelboards and transformers are existing to remain.. Except as otherwise indicated, provide single line of text, 3/4" high lettering on 1-1/2" high sign (1/2" letters, 2" high sign where 2 or 3 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work.

- a. Disconnect switches
- b. Motor Starters

\*Labels for individual devices shall be clear adhesive (Kroy machine type) with black lettering (3/16" high) located near the bottom of the plate. Label switches and receptacles and covers of raceway j-boxes with the panel and circuit number feeding the device. Label all Fire Alarm and Security devices in accordance with the appropriate Fire Alarm and Security specification. Device plates for switches and receptacles shall also be labeled on back side of plate using permanent black ink.

2. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

END OF SECTION 26 05 53



## **SECTION 26 08 05 - FIELD TEST AND OPERATIONAL CHECK FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### 1.1 CONDITIONS AND REQUIREMENTS

- A. Refer to other Division 26 Specification for Supplemental Information and requirements.

#### 1.2 DESCRIPTION

- A. Work Included in this Section:
  - 1. Distribution Equipment
  - 2. 600 Volt Cable Insulation Test

#### 1.3 GENERAL SCOPE

- A. It is the intent of these tests to assure that all electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications.
- B. The test and inspections shall determine the suitability for energization.

#### 1.4 TEST REPORT

- A. The test report shall include the following:
  - 1. Summary of project
  - 2. Description of equipment tested
  - 3. Description of tests
  - 4. List of test equipment used and most recent calibration date
  - 5. Test results
  - 6. Conclusions and recommendations
  - 7. Appendix, including appropriate test forms
- B. The test report shall be bound and its contents certified.
- C. Submit 3 copies of the completed report to the Architect no later than 15 days after completion of test unless directed otherwise.

#### 1.5 FAILURE TO MEET TEST

- A. Any system material or workmanship which is found defective on the basis of acceptance test shall be reported directly to the Architect.
- B. Contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory, without additional cost to Owner.

**PART 2 - PRODUCTS (NOT APPLICABLE)**

**PART 3 - EXECUTION**

3.1 600 VOLT CABLE INSULATION TEST

- A. Megger and record insulation resistances of all 600 volt insulated conductors size 4/0 AWG and larger using a 500 volt megger for one minute. Make tests with circuits isolated from source and load.

3.2 DISTRIBUTION EQUIPMENT

- A. Check cleanliness of all interiors and all parts. Remove any excess packing, shipping bolts, etc.
- B. Tighten all points of connection with torque wrench. Torque values per manufacturers recommendation.
- C. Verify all proper operating condition of equipment mechanically and electrically.
- D. If any equipment is found defective during operational check, it shall be replaced by the Contractor without cost to the Owner and test repeated by the Contractor without cost to the Owner and test repeated until satisfactory results are obtained.

END OF SECTION 26 08 05

## **SECTION 26 28 16 - ENCLOSED SWITCHES**

### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. Extent of circuit and motor disconnect switch work is indicated on drawings and schedules.
- B. Types of circuit and motor disconnect switches in this section include the following:
  - 1. Equipment disconnects
  - 2. Motor-circuit disconnects
- C. Wires/cables, raceways, and electrical boxes and fittings required in connection with circuit and motor disconnect work are specified in other Division-26 sections.

### **PART 2 - PRODUCTS**

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements on this specification and shall be of the same manufacturer as the electrical distribution equipment specified in the other Division 26 sections.

#### 2.2 DISCONNECT SWITCHES

- A. General-Duty Disconnect Switches: For switches rated less than 100 amps provide surface-mounted, general-duty type, sheet-steel enclosed switches, of types, sizes, and electrical characteristics indicated; rated for system voltage, 60 Hz, with required number of poles and solid neutral incorporating spring assisted, quick-make, quick-break switches. Equip with operating handle which is integral part of enclosure base and whose operating position is easily recognizable and is capable of being padlocked in OFF position. Construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts and positive pressure type reinforced fuse clips where fusing is required. The enclosure shall be NEMA rated to suit the atmospheric conditions of the equipment surroundings and of the manufacturer's standard finish. When used as service disconnect, provide with UL markings indicating "suitable for use as service equipment".
- B. Motor-Circuit Disconnect Switches Must Be HP Rated.

### **PART 3 - EXECUTION**

#### 3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES

- A. Install circuit and motor disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. All disconnects and equipment enclosures located in mechanical rooms shall be housed in a NEMA 3R enclosure.

- C. Coordinate motor and circuit disconnect switch installation work with electrical raceway work, location of equipment, and as necessary for proper interface. Provide U-channel supports from floor and/or structure where required to mount disconnects at free-standing equipment.
- D. Install disconnect switches used with motor-driven appliances, and motors and controllers within sight of controller position for motors greater than 1/8 HP.

3.2 GROUNDING

- A. Provide equipment grounding connections, sufficiently tight to ensure a permanent and effective ground as required by NEC and in "Grounding" section of Division-26.

3.3 FIELD QUALITY CONTROL

- A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.

END OF SECTION 26 28 16

## **SECTION 26 41 13 - LIGHTNING PROTECTION FOR STRUCTURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section includes lightning protection system for ordinary structures.
- B. Work to be performed under final phase of project.
- C. Section includes lightning protection system for the following:
  - 1. Ordinary structures.
- D. The system shall consist of a complete conductor network at the roof and include air terminals, connectors, splicers, bonds, down leads and proper ground terminals.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Include layouts of the lightning protection system, with details of the components to be used in the installation.
  - 2. Include raceway locations needed for the installation of conductors.
  - 3. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.
  - 4. Include roof attachment details, coordinated with roof installation.
  - 5. Calculations required by NFPA 780 for bonding of metal bodies.

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Lightning protection cabling attachments to roofing systems and accessories.
  - 2. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
  - 3. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.
- B. Qualification Data: For Installer.

- C. Product Certificates: For each type of roof adhesive for attaching the roof-mounted air terminal assemblies, approved by the roofing-material manufacturer.
- D. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For lightning protection system to include in maintenance manuals.
  - 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
    - a. Dimensioned site plan showing dimensioned route of the ground loop conductor and the ground rod locations. Comply with requirements of Section 01 78 39 "Project Record Documents."
    - b. A system testing and inspection record, listing the results of inspections and ground resistance tests, as recommended by NFPA 780, Annex D.
- B. Completion Certificate:
  - 1. LPI Master Certificate

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: The installation shall be accomplished by a company with at least 5 years of experience and that is listed with Underwriters Laboratories for lightning protection installation. They shall also be an active member of the United Lightning Protection Association, Lightning Safety Alliance, and Lightning Protection Institute. The company will be also under the direct supervision of the system designer.

### **PART 2 - PRODUCTS**

#### 2.1 PERFORMANCE REQUIREMENTS

- A. UL Lightning Protection Standard: Comply with UL 96A requirements for Class I buildings.
- B. Lightning Protection Components, Devices, and Accessories: Listed and labeled by a qualified testing agency as complying with UL 96, and marked for intended location and application.

#### 2.2 MATERIALS

- A. All materials shall be copper, bronze, or stainless steel. Aluminum components shall be used in locations where system components are mounted to aluminum surfaces to avoid galvanic corrosion of dissimilar metals.
- B. Class 1 Main Conductors:
  - 1. Stranded Copper: 57,400 circular mils in diameter
- C. Secondary Conductors:

1. Stranded Copper: 26,240 circular mils in diameter
- D. Ground Rods:
1. Material: Solid copper
  2. Diameter: 3/4 inch
  3. Rods shall be not less than 120 inches long.
- E. Conductor Splices and Connectors: Compression fittings that are installed with hydraulically operated tools, or exothermic welds, approved for use with the class type.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install lightning protection components and systems according to UL 96A.
- B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees and 8 inches in radius and narrow loops.
- C. As possible, conceal conductors within normal view from exterior locations at grade within 200 feet of building. Comply with requirements for concealed installations in UL 96A.
1. Roof penetrations required for down conductors and connections to structural-steel framework shall be made using listed through-roof fitting and connector assemblies with solid rods and appropriate roof flashings. Use materials approved by the roofing manufacturer for the purpose. Conform to the methods and materials required at roofing penetrations of the lightning protection components to ensure compatibility with the roofing specifications and warranty.
  2. Install conduit where necessary to comply with conductor concealment requirements.
  3. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.

#### **3.2 CONNECTIONS**

- A. Aboveground concealed connections, and connections in earth or concrete, shall be done by exothermic welds or by high-compression fittings listed for the purpose.
- B. Aboveground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: bolted connectors.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3.3 CORROSION PROTECTION

- A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
- B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

- A. Prepare test and inspection reports and certificates.
- B. Upon completion of the installation, the contractor shall furnish the Master Label issued by Underwriters Laboratories, Inc. for this system.

**END OF SECTION 26 41 13**





## SCHEDULE D – MINIMUM INSURANCE REQUIREMENTS

### MINIMUM INSURANCE REQUIREMENTS

The following listed minimum insurance requirements shall be carried by all contractors and consultants unless otherwise specified in the City's solicitation package, Special Provisions or Standard Specifications.

1.  Commercial General Liability for limits not less than \$1,000,000 combined single limit for bodily injury and property damage for each occurrence. Coverage shall include blanket contractual, broad form property damage, products and completed operations.
2.  Workers' Compensation and Employers Liability as required by statute. Employers Liability coverage is to be carried for a minimum limit of \$100,000.
3.  Automobile Liability covering any auto (including owned, hired, and non-owned autos) with a minimum of \$1,000,000 each accident combined single limit.

Except for workers' compensation and employer's liability insurance, the City of Colorado Springs must be named as an additional insured. Certificates of Insurance must be submitted before commencing the work and provide 30 days' notice prior to any cancellation, non-renewal, or material changes to policies required under the contract.

All coverage furnished by contractor is primary, and any insurance held by the City of Colorado Springs is excess and non-contributory.

The undersigned certifies and agrees to carry and maintain the insurance requirements indicated above throughout the contract Period of Performance"

\_\_\_\_\_  
(Name of Company)

\_\_\_\_\_  
(Signature) (Date)