

Project Manual for
Shelby County Sheriff's Department

Equipment Storage Building
989 Dovecrest Road
Memphis, TN 38134

RFP # 14-004-60

Owner

Shelby County Government
Shelby County, Tennessee

Civil Engineer

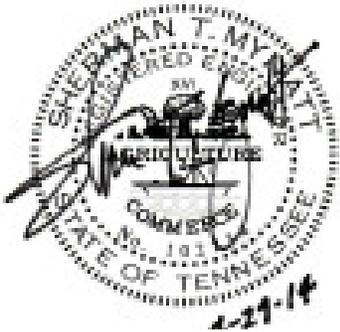
ETI Corporation

Mechanical Engineer

Barham, Cain, Mynatt, Inc.

Electrical Engineer

Canup Engineering, Inc.



April 29, 2014

john pruetts architects

1869 madison avenue
memphis, tn 38104
901.721.9062 phone
901.721.9063 fax
pruettsarchitects@bellsouth.net

SECTION 00 00 00
TABLE OF CONTENTS

00 00 00	TABLE OF CONTENTS
00 01 15	LIST OF DRAWINGS
00 01 20	PROJECT DIRECTORY
00 11 19	REQUEST FOR PROPOSAL
00 21 13	INSTRUCTION TO BIDDERS
00 41 13	BID FORM
01 11 13	SUMMARY OF THE WORK
01 11 20	SHELBY COUNTY GENERAL CONDITIONS OF THE CONTRACT
01 21 43	TIME ALLOWANCES (WEATHER DELAYS)
01 31 13	PROJECT COORDINATION
01 31 19	PROJECT MEETINGS
01 32 16	CONSTRUCTION PROGRESS SCHEDULE
01 33 23	SUBMITTALS
01 50 00	CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
01 66 00	DELIVERY STORAGE AND HANDLING
01 74 23	CLEANING
01 77 19	CLOSEOUT REQUIREMENTS
02 41 19	SELECTIVE DEMOLITION
03 30 00	CAST IN PLACE CONCRETE
03 35 29	CURING, SEALING, AND HARDENING CONCRETE FLOORS
04 22 00	REINFORCED UNIT MASONRY
04 22 10	CONCRETE UNIT MASONRY
05 12 23	MISCELLANEOUS STEEL FABRICATIONS
07 21 00	INSULATION
07 40 00	PRE-FORMED METAL WALL PANELS
07 92 00	SEALANTS AND CAULKING
08 10 00	DOORS AND FRAMES
08 33 23	OVERHEAD COILING DOORS
08 36 13	OVERHEAD SECTIONAL DOORS
08 71 00	DOOR HARDWARE
09 22 16	METAL STUD FRAMING
13 34 19	PRE-ENGINEERED STEEL BUILDINGS
22 05 00	COMMON WORK RESULTS FOR PLUMBING
22 05 29	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
22 07 00	PLUMBING INSULATION
22 11 16	DOMESTIC WATER PIPING
22 11 19	DOMESTIC WATER PIPING SPECIALTIES
22 13 16	SANITARY WASTE AND VENT PIPING
22 13 19	SANITARY WASTE PIPING SPECIALTIES
22 33 00	ELECTRIC DOMESTIC WATER HEATERS

22 40 00	PLUMBING FIXTURES
23 05 00	COMMON WORK RESULTS FOR HVAC
23 05 13	COMMON MOTOR REQUIREMENTS
23 05 29	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
23 05 48	SEISMIC RESTRAINT OF HVAC SYSTEMS
23 05 93	TEST AND BALANCE
23 07 00	HVAC INSULATION
23 09 00	TEMPERATURE CONTROLS
23 11 23	NATURAL GAS PIPING
23 23 00	REFRIGERANT PIPING
23 31 13	DUCTWORK
23 33 00	AIR DUCT ACCESSORIES
23 37 13	DIFFUSERS REGISTERS AND GRILLS
23 51 00	CHIMNEYS AND VENTS
23 81 26	SPLIT SYSTEMS
26 00 00	BASIC ELECTRICAL REQUIREMENTS
26 05 19	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 05 33	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
26 05 48	SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 22 00	LOW-VOLTAGE TRANSFORMERS
26 24 16	PANELBOARDS
26 27 26	WIRING DEVICES
26 28 16	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
26 51 00	LIGHTING
28 13 00	ACCESS CONTROL
31 00 00	SITE WORK
31 05 00	SITE PREPARATION
31 22 00	EARTHWORK
31 23 16	EXCAVATION, TRENCHING AND BACKFILLING

END OF SECTION

SECTION 00 01 15
LIST OF DRAWINGS

A0	COVER, INDEX OF DRAWINGS
C1	DEMOLITION / PAVING PLAN
C2	GRADING & DRAINAGE PLAN
C3	EROSION CONTROL PLAN
C4	SITE UTILITY PLAN
A1	SITE DEMOLITION PLAN AND SITE PLAN
A2	FLOOR PLAN, EXTERIOR ELEVATIONS, SECTION/ELEVATIONS
A3	BUILDING SECTIONS, WALL SECTIONS
A4	SCHEDULES AND DETAILS
S1	FOUNDATION PLAN AND GENERAL NOTES
S2	DETAILS
M1	MECHANICAL SITE PLAN
M2	HVAC FLOOR PLAN
M3	HVAC SCHEDULES AND DETAILS
M4	HVAC SECTIONS AND COMCHECK
P1	OVERALL FLOOR PLAN – PLUMBING
E0	LEGEND, SCHEDULE AND NOTES
E1	SITE PLAN DEMOLITION AND ELECTRICAL
E2	FLOOR PLAN LIGHTING
E3	FLOOR PLAN POWER
E4	PANELBOARD AND RISER DIAGRAM

END OF SECTION

SECTION 00 01 20
PROJECT DIRECTORY

OWNER: Shelby County Sheriff's Office
Suite 9-26, 201 Poplar Avenue
Memphis, TN 38103
901.222.5563 phone
901.222.5928 fax
maurice.denbow@shelby-sheriff.org
ATTN: Maurice Denbow

ARCHITECT John Pruet Architects
1869 Madison Avenue
Memphis, TN 38104
901.721.9062 phone
901.721.9063 fax
pruetarchitects@bellsouth.net
ATTN: John Pruet

SECTION 00 11 19
REQUEST FOR PROPOSAL

Attached herein:

Request for Proposal
Shelby County Government
Purchasing Department
160 N. Main, Suite 900
Memphis, TN 38103

Issued: **tbd**
Due: **tbd**

RFP # **tbd**

Shelby County Sheriff's Department
EQUIPMENT STORAGE BUILDING
989 DOVECREST ROAD



Shelby County Tennessee

Mark Luttrell, Jr. Mayor

Request for Proposal

Shelby County Government

Purchasing Department

160 N. Main, Suite 900
Memphis, TN 38103

Issued: May 1, 2014

Due: May 22, 2014 no later than 4:00 P.M. (Central Standard Time)

RFP # 14-004-60

CONSTRUCTION OF

EQUIPMENT STORAGE BUILDING

SHELBY COUNTY SHERIFF'S DEPARTMENT

Shelby County Government is soliciting written proposals on a competitive basis for Construction Services for Construction of Equipment Storage Building, Shelby County Sheriff's Emergency Services and Reserve Building, 989 Dovecrest Road, Memphis, Tennessee 38134. Information regarding this RFP is located on the County's website at www.shelbycountyttn.gov. At the top of the home page, click on the links "Department," "P" for the Purchasing Department and "Bids" to locate the name of the above-described RFP. Copies of the project manual and drawing are posted at this location and can be downloaded at no cost to prospective bidders.

A **Mandatory** pre-bid conference will be held at **2:30 PM, Thursday, May 8, 2014** at the Shelby County Sheriff's Emergency Services and Reserve Building, 989 Dovecrest Road, Memphis, Tennessee 38134.

PLEASE BE ON TIME, ONCE THE PRE-BID CONFERENCE STARTS LATE ARRIVALS WILL NOT BE ALLOWED TO ATTEND.

The proposal, as submitted, should include all estimated costs related to the services requested by the RFP specifications. If selected, your proposal will be the basis for negotiating a contract with Shelby County Government. Your proposal must be received in the Shelby County Purchasing Department **no later than 4:00 p.m. on Thursday, May 22, 2014.** Proposals should be addressed to:

**Nelson Fowler, Manager A
Shelby County Government
Purchasing Department
160 N. Main St., Suite 900
Memphis, TN 38103**

The package containing an original (clearly identified as original) and four (4) copies of your proposal must be sealed and marked with the Proposer's name and "CONFIDENTIAL, "CONSTRUCTION OF EQUIPMENT STORAGE BUILDING, RFP # 14-004-60" noted on the outside.

Sincerely,

**Nelson Fowler, Manager A
Shelby County Government
Purchasing Department**

Cc: Maurice Denbow, Shelby County Sheriffs Department

TABLE OF CONTENTS

- I. INTRODUCTION
- II. MINIMUM PROPOSER REQUIREMENTS
- III. CORRESPONDENCE
- IV. PROPOSAL SUBMISSION DEADLINE
- V. PROPOSAL TIMELINE
- VI. PROPOSAL CONDITIONS
- VII. GENERAL REQUIREMENTS
- VIII. AWARD OF CONTRACT
- IX. NOTICE TO BIDDER

Note: Please make sure you pay close attention to Sections: I- IX .These sections will clearly outline what information is required to properly respond and prepare your RFP response.

Please download all of the additional information and attachments that accompany this RFP.

I. INTRODUCTION

Shelby County Government (the “County”), is seeking proposals from interested and qualified Contractors to submit proposals for Construction of a Equipment Storage Building, 989 Dovecrest Road, Memphis, Tennessee 38134. This Request for Proposal (“RFP”) is being released to invite interested and qualified firms to prepare and submit proposals in accordance with instructions provided where the successful candidate will be selected and invited to enter into a contractual relationship with Shelby County for the Services outlined in this RFP.

II. MINIMUM PROPOSERS REQUIREMENT

All Proposers must:

1. **Prime** and **LOSB** contractors must **apply** and **qualify** for an Equal Opportunity Compliance (EOC) certification number through our EOC Administration prior to submitting your response.
2. All bidders must submit a Bid Bond in the amount of 5% of their bid. This bond must be submitted with your bid.
3. The successful contractor must submit a performance/labor material bond, separate bonds each in the amount of 100% of the amount of the contract.
4. The successful contractor must submit a certificate of Insurance for the amount references in our specifications.
5. Have all appropriate licenses and certifications required in the State of Tennessee to perform the Services.
6. Meet all other requirements such as LOSB and performance requirements for Services in accordance with the provisions of this RFP.
7. Must attend our prebid conference.
8. Adhere to all Title VI requirements and provide proof/documentation.
9. A written statement of compliance to Title VI must be provided with your response.
10. Also, see page 27 for forms to be submitted with your bid.
11. Independent contractors (sole proprietors) must adhere to State of Tennessee Public Chapter No. 436, know as the “Tennessee Lawful Employment Act (effective date of 1/1/2012). Proof and documentation of employment eligibility must be included with the proposal.

Please Note: As a part of doing business with Shelby County, each individual, company, or organization is required to obtain an “Equal Opportunity Compliance” certification number prior to submitting your response.

You can access the online applications to receive the numbers indicated above at www.shelbycountyttn.gov. To obtain a vendor number and an EOC number, please follow the instructions below:

Vendor Number (Purchasing Department)

At the top of the home page, click on the links “Department”, “P” for the Purchasing Department and “Conducting Business with Shelby County”. The “Vendor Registration” link is at the bottom of the drop down box. Please download the application instructions and read thoroughly prior to accessing the application. (*Applications for a vendor number are accepted online only.*)

Equal Opportunity Compliance (EOC) Number (EOC Administration Office)

At the top of the home page, click on the links “Department”, “E” for the Equal Opportunity Compliance and “Contract Compliance Program”. The “Contract Compliance Packet” link is in the middle of the page. Please print the packet and mail or fax the completed packet to the EOC office. The mailing address is 160 N. Main Street, Suite 501, Memphis, TN 38103. The fax number is 901-222-1101.

If you have any questions regarding the application, you may contact Purchasing at (901)222-2250 or the EOC Administration at (901) 222-1100.

III. CORRESPONDENCE

All correspondence, proposals, and questions concerning the RFP are to be submitted to:

**Nelson Fowler, Manager A
Shelby County Government
160 N. Main St. Suite 900
Memphis, TN. 38103**

Respondents requesting additional information or clarification are to contact Nelson Fowler in writing at nelson.fowler@shelbycountyttn.gov or at the address listed above. Questions should reference the section of the RFP to which the question pertains and all contact information for the person submitting the questions. ***IN ORDER TO PREVENT AN UNFAIR ADVANTAGE TO ANY RESPONDENT, VERBAL QUESTIONS WILL NOT BE ANSWERED. The deadline for submitting questions will be Thursday, May 15, 2014 by 12:00 p.m. (CST).*** These guidelines for communication have been established to ensure a fair and equitable process for all respondents.

Note: Individual vendor questions will be answered by e-mail as received before the cut-off date. All written questions submitted by the deadline indicated above will be answered and posted on the County’s website at www.shelbycountyttn.gov within forty eight (48) hours of the above cut-off date.

Please be aware that contact with any other personnel (other than the person clearly identified in this document) within Shelby County regarding this RFP may disqualify your company from further consideration.

IV. PROPOSAL SUBMISSION & DEADLINE

All proposals must be received at the address listed above no later than **Thursday, May 22, 2014 @ 4:00 p.m. (CST)**. Facsimile or e-mailed proposals will not be accepted since they do not contain original signatures. Postmarks will not be accepted in lieu of actual receipt. Late or incomplete proposals may not be opened and considered.

V. PROPOSAL TIMELINE

Shelby County reserves the right to modify this timeline at any time. If the due date for proposals is changed, all prospective proposers shall be notified.

Request for Proposals Released	Thursday, May 1, 2014
Mandatory Pre-bid (if applicable)	Thursday, May 8, 2014 at 2:30 PM
Proposal Due Date	Thursday, May 22, 2013
Notification of Award	June 2014
Services to Commence	Upon Execution of the Contract

The County may reproduce any of the proposer’s proposal and supporting documents for internal use or for any other purpose required by law.

VI. PROPOSAL CONDITIONS

a. Contingencies

This RFP does not commit the County to award a contract. The County reserves the right to accept or reject any or all proposals if the County determines it is in the best interest of the County to do so. The County will notify all proposers, in writing, if the County rejects all proposals.

b. Modifications

The County reserves the right to issue addenda or amendments to this RFP.

c. Proposal Submission

To be considered, all proposals must be submitted in the manner set forth in this RFP. It is the proposer’s responsibility to ensure that its proposals arrive on or before the specified time.

d. Incurred Costs

This RFP does not commit the County to pay any costs incurred in the preparation of a proposal in response to this RFP and Proposers agree that all costs incurred in developing this RFP are the Proposer’s responsibility.

e. Final Authority

The final authority to award a contract rests solely with the Shelby County Purchasing Department.

f. Proposal Validity

Proposals submitted hereunder will be firm for at least ninety (90) calendar days from the due date unless otherwise qualified.

g. Disclosure of Proposal Contents

Proposer understands and acknowledges that the County is a governmental entity subject to the laws of the State of Tennessee and that any reports, data, or other information supplied to the County is subject to being disclosed as a public record in accordance with the laws of the State of Tennessee. All proposals and other materials submitted become the property of Shelby County Government.

h. Non-Discrimination and Title VI

The contractor hereby agrees, warrants, and assures compliance with the provisions of Title VI and VII of the Civil Rights Act of 1964 and all other federal statutory laws which provide in whole or in part that no person shall be excluded from participation or be denied benefits of or be otherwise subjected to discrimination in the performance of this Contract or in the employment practices of the contractor on the grounds of handicap and/or disability, age, race, color, religion, sex, national origin, or any other classification protected by federal, Tennessee State Constitutional or statutory law. The contractor shall upon request show proof of such non-discrimination and shall post in conspicuous places available to all employees and applicants notices of non-discrimination.

Any recipient entity shall be subject to the requirements of Title VI of the Civil Rights Act of 1964, 42 U.S.C. 2000d et seq., and regulations promulgated pursuant thereto. It shall develop a Title VI implementation plan with participation by protected beneficiaries as may be required by such law or regulations. To the extent applicable, such plan shall include Title VI implementation plans sub recipients of federal funds through the entity. The contractor shall produce the plan upon request of Shelby County Government. Failure to provide same shall constitute a material breach of contract.

i.

**SHELBY COUNTY GOVERNMENT
LOCALLY OWNED SMALL BUSINESS (LOSB) PROGRAM
FOR CONSTRUCTION SERVICES**

CONSTRUCTION OF EQUIPMENT STORAGE BUILDING

General

Shelby County Government is committed to a policy of non-discrimination pursuant to the Equal Protection provisions of the United States Constitution. It is further the policy of Shelby County that it's purchasing and contracting practices encourage the use of Locally-Owned Small Businesses (LOSB's) in all solicitations. In furtherance of these policy objectives, Shelby County seeks to afford all citizens equal opportunities to do business on county contracts and to ensure that all bidders, proposers, or Contractors doing business with Shelby County provide to LOSB's, maximum practicable opportunities, commensurate with availability, price and capabilities required, to participate on contracts which are paid for, in whole or in part, with monetary appropriations from Shelby County.

Shelby County seeks to prevent discrimination against any person or business in pursuit of these opportunities on the basis of race or gender. Shelby County will conduct its contracting and purchasing programs so as to discourage any discrimination and will actively seek to resolve all claims of discrimination brought against Shelby County or any Contractors involved in such contracting and purchasing programs.

Shelby County has determined that? 25% of the contract shall be contracted with LOSB's vendors. For assistance and information regarding LOSB participation, Bidders shall contact:

Ms. Carolyn Griffin
Office of Equal Opportunity Compliance
Board of Commissioners of Shelby County
160 North Main Street, Suite 501
Memphis, Tennessee 38103
Phone: 901-222-1100
Fax: 901-222-1101
E-mail: carolyn.griffin@shelbycountytg.gov

Definitions

The definitions used in this document are as follows:

1. **“Bidder”** or **“Proposer”** means any person, firm, partnership, association, or joint venture seeking to be awarded a contract or subcontract to provide goods, commodities or services.

2. **“Certification”** or **“Certified”** means a Business that is certified by Shelby County Government under the LOSB program.
3. **“Commercially useful function”** means being responsible for the management and performance of a distinct element of the total work.
4. **“Contractor”** shall mean any person or business enterprise that submits a bid or proposal to provide labor, goods, or services to Shelby County by contract for profit in the area of construction or construction-related activities; and, any person or firm who supplies or provides labor, goods, or services to Shelby County by contract for profit.
5. **“Efforts to Achieve LOSB Participation”** means that the Contractor will solicit LOSB Participation with respect to the procurement and will consider all sub-bids and quotations received from LOSB’s. When a subcontract is not awarded to the LOSB, the Contractor must document the reason(s) the award was not made and substantiate that documentation in writing pursuant to the provisions of this Program.
6. **“Locally Owned Small Business (LOSBS)”** means a business whose home office is located in Shelby County, whose annual revenues do not exceed \$3,000,000 and who has been certified by Shelby County Office of Equal Opportunity Compliance.
7. **“Non-LOSBS”** means a business, which is not certified as a LOSBS.
8. **“Unavailable”** means either that: (1) there is no LOSB providing goods or services requested; or, (2) no LOSB submitted a bid.

Requirements and Compliance

All firms or entities seeking to become Contractors as outlined herein are required to make good faith efforts to achieve LOSB participation when submitting a proposal or bidding on Shelby County procurements. Bidders and proposers shall not discriminate on the basis of race or gender when soliciting bids in the performance of Shelby County’s procurements. Discrimination complaints brought to the attention of Shelby County Office of Equal Opportunity Compliance (or its designee) will be reviewed and investigated to the extent necessary to determine the validity of such complaints and what actions, if any, should be taken by Shelby County.

Policies and Procedures

Shelby County may adopt policies and procedures as necessary to carry out and implement its powers and duties with regard to the LOSB Program. It is the goal of Shelby County to encourage participation by LOSB’s and to adopt rules and regulations which achieve to the greatest extent possible a level of participation by LOSB’s taking into account the total number of all Contractors and suppliers. Therefore, Shelby County will review each procurement request to determine the maximum potential for utilization of LOSB’s. This review is based on the availability of qualified LOSB’s providing goods or services as it relates to the scope of the bid or procurement process. The following procedures may be utilized during the procurement process.

1. Pre-Bid Activity

a. Bid Language

Shelby County may insert language into each bid specification describing the LOSB Program to assure that all prospective bidders are aware of the requirements to make efforts to utilize LOSB's.

b. Notification

Shelby County may provide written notification to Contractors and LOSB's regarding: pre-bid conferences; technical assistance to LOSB's; LOSB Program procedures and required documentation; and, provide a list of LOSB's who have expressed an interest in competing for the bid or in performing as a subcontractor.

2. Contractor's Responsibilities

a. Efforts to Achieve LOSB Participation

All entities seeking to become Contractors are required to make efforts to achieve maximum LOSB participation, as outlined in this LOSB Program, when submitting a response to a bid or negotiated proposal in response to a Shelby County procurement opportunity. Such Efforts should be documented on **LOS Form "A."**

b. Utilization

Contractors are required to utilize legitimate LOSB's in order to receive credit for the utilization of a LOSB. Contractors must document all LOSB's to be utilized, the percentage of utilization and the intended scope of work. Such information should be submitted on **LOS Form "B."** This documentation must be submitted with the bid or negotiated proposal document.

c. Commercially Useful Functions

All LOSB's identified on **LOS Form "C"** or **LOS Form "D"** shall perform a Commercially Useful Function.

d. Unavailability

If a potential Contractor's efforts to obtain LOSB participation are unsuccessful due to the unavailability of a LOSB, the Contractor will submit a statement of unavailability. **LOS Form "A."**

e. Pre-Work Conference

Any Contractor who is the successful bidder shall be required to attend a conference with Shelby County prior to beginning the work. The primary purpose of this conference is to review the project scope and review LOSB participation as outlined in **LOS Form "B."** Shelby County will also review the Statement of Intent to Perform as a Subcontractor or Provide Supplies or Services as documented on **LOS Form "C."**

f. Post-Award Change

Any Contractor who determines that a LOSB identified on **LOS Form "B"** cannot perform shall request approval from Shelby County to contract with an alternate subcontractor pursuant to this LOSB

Program. Such request will be reviewed and approved only after adequate documentation for the proposed change is presented.

g. **LOSB Certification**

Each month the Contractor shall submit **LOSB Form “D”** certifying all payments made to LOSB’s.

3. LOSB Responsibilities

a. **Commercially Useful Function**

It is the responsibility of each LOSB providing subcontracted goods and/or services to submit **LOSB Form “C”** certifying that it is performing the work and that it is a Commercially Useful Function.

Written Agreement

Shelby County policies and procedures on LOSB participation are designed to create contractual relationships between Contractors and LOSB’s. Therefore, a Contractor may utilize the services of a LOSB in estimating and satisfying the scope of work, provided that a written contract/agreement is executed between the Contractor and the LOSB.

Certification

To ensure that the ownership and control over decision-making and day-to-day operations of a Certified LOSB is legitimate, Shelby County reserves the right to verify the ownership and control of each LOSB utilized.

Monitoring LOSB Utilization

Shelby County intends to monitor and enforce this LOSB Program. Shelby County reserves the right to conduct random audits of each of its Contractor’s LOSB’s. Shelby County reserves the right to reevaluate a LOSB’s certification at any time.

Efforts to Achieve LOSB Participation

The Contractor shall consider all bids and/or quotations received from LOSB’s. When a subcontract is not awarded by a Contractor to any of the competing LOSB’s, the Contractor must document the reason(s) the award was not made to the LOSB’s. It is the responsibility of the Contractor to prove that it employed Efforts to Achieve LOSB participation. Evidence supporting the Contractor’s Efforts must be documented on **LOSB Form “A,”** which must include, but is not limited to, the following:

1. Contractor must submit proof that it solicited LOSB participation through reasonable and available means including, but not limited to:
 - a. Written notices to LOSB’s who have the capability to perform the work of the contract or provide the service;
 - b. Direct mailing, electronic mailing, facsimile or telephone requests.

2. Contractor must submit proof that it provided interested LOSB's with adequate information about plans, requirements and specifications of the contract in a timely manner to assist them in responding to a solicitation.
3. Contractor must submit proof that it made Efforts to Achieve LOSB Participation including, but not limited to, proof that it made opportunities available to LOSB suppliers and identified opportunities commensurate with opportunities made available and identified to Non LOSB's. Such proof will include the names of businesses, contact person(s), addresses, telephone numbers, and, a description of the specifications for the work selected for subcontracting.
4. Contractor must submit proof that it allowed LOSB's the opportunity to review bid specifications, blue prints and all other bid related items at no charge. The Contractor must allow sufficient time for review prior to the bid deadline.
5. Contractor must submit proof that it made Efforts to Achieve LOSB Participation by not rejecting a LOSB as unqualified or unacceptable without sound reasons based on a thorough investigation of their capabilities. Contractor must submit proof of the basis for rejecting any LOSB deemed unqualified or unacceptable by the Contractor. The Contractor will not impose unrealistic conditions of performance on LOSB's seeking subcontracting opportunities.

The Contractor must fully cooperate with Shelby County in its post-contract award LOSB Program audit and compliance efforts.

Substitution of LOSB's after Contract Award

In order to make a substitution of a LOSB, a Contractor must make a request to Shelby County. This request must be submitted in writing to Shelby County. Shelby County reserves the right to approve any substitution of a LOSB. The Contractor has the responsibility to provide Shelby County with a reasonable basis for the substitution. If the Contractor desires to substitute the LOSB with a Non-LOSB, then the Contractor must comply with the Effort to Achieve LOSB Participation provisions set forth herein.

Noncompliance with LOSB Program

Any of the following reasons, individually or collectively, may result in suspension from bidding, prohibition from contracting, or cancellation of contracts:

1. The failure to perform according to contract provisions relating to this LOSB Program;
2. Violation of, circumvention of, or failure to comply with the LOSB Program; and/or,
3. Other reasons deemed appropriate by Shelby County.

Questions and Information

Questions regarding this LOSB Program and requests for information should be directed to:

Ms. Carolyn Griffin
Office of Equal Opportunity Compliance
Board of Commissioners of Shelby County
160 North Main Street, Suite 501
Memphis, Tennessee 38103
Phone: 901-222-1100
Fax: 901-222-1101
E-mail: carolyn.griffin@shelbycountytg.gov

Construction

This LOSB Program is consistent with Shelby County Policies and Procedures. Wherever conflicts exist, the provision in the Shelby County Policies and Procedures will prevail.

LOSB Program Forms Description

- **LOS Form A -- Certification of Efforts**

Contractors are required to submit **LOS Form "A"** with proposals as evidence and documentation of efforts that have been made to contact LOSB's for participation as subcontractors, joint venture partners, or suppliers of goods and services. Contractors are required to contact LOSB's and solicit quotes for goods and services. All responses to the Contractor's solicitation should be recorded and reported.

- **LOS B Form B -- LOSB Utilization Plan**

A Contractor is required to submit **LOS B Form "B"** with its Proposal in order to identify all LOSB's they propose to utilize in providing the goods and services included in the Proposal. Contractors may only include a proposed provider of goods or services on **LOS B Form "B,"** if the entity is a legitimate LOSB. Additionally, if such entity will provide services, Contractors may only list LOSB's on **LOS B Form "B"** if the entity will perform a Commercially Useful Function. The Successful Contractor will be required to finalize and submit **LOS B Form "B"** prior to award of a contract. **LOS B Form "B"** will be incorporated into the contract and will become a contractual obligation of the Successful Contractor. **LOS B Form "B"** shall not be changed or altered after award of a contract without approval from Shelby County. The Contractor is required to provide written notice describing the reasons for any proposed change to Shelby County and to obtain approval from Shelby County of any changes to **LOS B Form "B."**

- **LOS B Form C --Statement of Intent to Perform as a Subcontractor or Provide Supplies or Services**

Contractors are required to have each subcontracted LOSB providing services complete **LOS B Form "C"** certifying that it is performing the work and that it is a Commercially Useful Function.

- **LOS B Form D -- Statement of Payments to LOSB's**

Contractors are required to record and maintain information regarding the utilization of LOSB's and all other information during the performance of awarded contracts. This information shall be recorded and maintained on **LOS B Form "D."** The form is required to be submitted to Shelby County each month. **LOS B Form "D"** must be completed in its entirety with information regarding the types of goods purchased from LOSB's or the types of services rendered by LOSB's and dollars amounts paid for their goods or services.

**Shelby County
 LOSB Program**

LOS B FORM A

CERTIFICATION OF EFFORTS TO ACHIEVE LOSB PARTICIPATION

(To Be Submitted with the Bid/Proposal)

Company Name: _____

Bid No.: _____

I certify that the following efforts were made to achieve LOSB participation:

YES NO

A	Provided written notices to LOSB's who have the capability to perform the work of the contract or provide the service		
B	Direct mailing, electronic mailing, facsimile or telephone requests		
C	Provided interested LOSB's with adequate information about plans, requirements and specifications of the contract in a timely manner to assist them in responding to a solicitation		
D	Allowed LOSB's the opportunity to review bid specifications, blue prints and all other bid/RFP related items at no charge, and allowed sufficient time for review prior to the bid deadline		
E	Acted in good faith with interested LOSB's, and did not reject LOSB's as unqualified or unacceptable without sound reasons based on a thorough investigation of their capabilities		
F	Did not impose unrealistic conditions of performance on LOSB's seeking subcontracting opportunities		

Additionally, I contacted the referenced LOSB's and requested a bid/proposal. The responses I received were as follows:

Name and Address of LOSB	Type of Work And Contract Items, Supplies or Services to be Performed	Response	Reason for Not Accepting Bid/Proposal

(If additional space is required, this form may be duplicated)

If applicable, please complete the following:

I hereby certify that LOSB's were "Unavailable" as defined in the LOSB Program to submit bids to provide goods and services for this RFP/Bid's purpose.

Reasons for the "Unavailability":

Submitted by:

Authorized Representative Signature

Title

Date

**Shelby County
LOSB Program**

LOSB FORM B

LOSB UTILIZATION PLAN
(To Be Submitted with the Bid/Proposal)

Company: _____
Bid No.: _____

I, _____, do certify that on the following procurement opportunity,
(Contractor)
_____, the following LOSB's will be utilized as sub-contractors, suppliers,
(Opportunity)
or to provide professional services:

Name	Description of Work	Contract Value	LOSB Number

(If additional space is needed this form may be duplicated)

TOTAL CONTRACT VALUE: _____
TOTAL % OF LOSB PARTICIPATION: _____

The successful bidder/proposer is required to finalize and submit this form prior to award of a contract. Joint Venture Agreements, partnering agreements and all pertinent information must be presented prior to contract award. This information will be incorporated into the contract and will become a contractual obligation of the successful bidder/proposer. The finalized LOSB Form B shall not be changed or altered after award of a contract without approval from Shelby County. The successful bidder/proposer is required to provide written notice describing the reasons for the change to Shelby County to obtain approval of any changes to LOSB Form B.

Submitted by:

Authorized Representative Signature

Title

Date

**Shelby County
LOS B Program
LOS B FORM C**

**STATEMENT OF INTENT TO PERFORM AS A SUBCONTRACTOR OR
PROVIDE SUPPLIES OR SERVICES
(To Be Submitted Prior to Contract Award)**

Company Name: _____
Bid No.: _____

I, _____, intend to provide supplies or services in connection with the
(Subcontractor/Provider)
above **bid/proposal** request as a LOSB.

I am prepared to perform a “**Commercially Useful Function**” in connection with the above project.

The following are the work items to be performed:

at the following price: \$ _____.

If applicable, please complete the following:

I have or will enter into a formal agreement with _____ for the above-
(Company)
described scope of work, supplies, or services conditioned upon the execution of a contract
with Shelby County.

I hereby certify that this statement is true and correct:

Business Information: Submitted by:

Business: _____
Authorized Representative (Print)

Address: _____

Title _____
Authorized Representative's Signature

Phone: _____

Date _____
Facsimile: _____

**Shelby County
 LOSB Program**

LOS B FORM D

STATEMENT OF PAYMENTS TO LOSB'S
 (To Be Submitted Monthly and with Final Payment Request)

Company Name: _____

Name/Contract No.: _____

Payment Request Number: _____

Name of Firm	Description of work	Total Amount Due This Month	Total Dollars Paid To Date	% of Contract Completed	Start Date of Contract	End Date of Contract

(If additional space is needed this form may be duplicated)

I hereby certify that this statement is true and that above payments have been made.

Business Information:

Submitted by:

Business: _____

 Authorized Representative (Print)

Address: _____

 Title

 Authorized Representative's Signature

Phone: _____

Date
Facsimile: _____

LOCALLY OWNED SMALL BUSINESS PURCHASING PROGRAM
RULES AND REGULATIONS:

(i) The Administrator of Purchasing in conjunction with the Administrator of EOC shall identify certain goods and services required by the County to be set aside for special purchasing procedures for locally owned small businesses.

(ii) Only certified locally owned small businesses will be allowed to submit competitive bids on the goods or services identified under paragraph (i) above.

(iii) The Administrator of Purchasing shall, in conjunction with the Administrator of EOC, annually review the Shelby County Capital Improvement Program to determine those projects with a construction cost of \$250,000 or more. Contracts amounting to at least ten (10%) of the construction costs of such project shall be awarded to locally owned small businesses as defined herein, except as set forth in sub-paragraph (vi) of this section, either as part of the conditions of the solicitation for general contractors bidding on these projects, or as separate bids issued by the County for subcontracts that may be assigned to general contractors.

(iv) After adhering to all other bidding and purchasing requirements of the County, not inconsistent with this part, if no bids are received from locally owned small businesses, then the County may solicit bids for the goods or services from all other sources.

(v) On all purchases and/or contracts entered into by the County, the Purchasing Administrator or his or her designee shall have the right to negotiate with any supplier of goods or services to the County for the inclusion of locally owned small business subcontractors and/or suppliers in the contract award.

(vi) Failure by a supplier or contractor to include locally owned small business sub-contractors or suppliers in its bid or contract may be grounds for rejection of said bid or contract unless the supplier or contractor can show documented evidence of good cause why none were included.

(vii) Any locally owned small business awarded a contract or purchase order under this section shall not sublet, subcontract, or assign any work or services awarded to it without the prior written consent of the Mayor or the Purchasing Administrator.

(viii) As to those purchases below the requirement for a formal bid solicitation

(currently, under \$15,000) and not included in the locally owned small business set aside, the Administrator of Purchasing shall determine if any locally owned small business offers that product or service. If so, at least one such eligible locally owned small business should be included in the vendors contacted for an opportunity to bid, and the Administrator of Purchasing may, at his discretion, designate in a purchase order the purchase of such goods and services from the identified locally owned small business.

(ix) In those situations where a locally owned small business as defined herein, engages in open competitive bidding for County contracts, the Administrator of Purchasing shall provide for a preference for the locally owned small business where responsibility and quality are equal. Said preferences shall not exceed five percent (5%) of the lowest possible bidder meeting specifications. The preference shall be applied on a sliding scale in the following manner:

- a. A preference of up to five percent (5%) shall be allowed for contracts up to \$500,000.00;
- b. A preference of up to three and five-tenths percent (3.5%) shall be allowed for contracts up to \$750,000.00;
- c. A preference of two and one-half percent (2.5%) shall be allowed for contracts up to \$1,000,000.00;
- d. A preference of two percent (2%) shall be allowed for contracts that exceed \$1,000,000.00.

(x) For construction contracts over \$2,000,000.00, the Administrator of Purchasing shall provide for a preference of two percent (2%) to general contractors meeting the requirements of Section 1, Subparagraph B, if fifty percent (50%) or more of the total work comprising the bid has been or will be awarded to certified locally owned small businesses. The fifty percent subcontracting threshold must be met prior to contract execution.

(xi) The Administrator of Purchasing may divide a single bid package for any purchase of goods and services into two or more smaller bid packages in any case that the Administrator of Purchasing reasonably believes that the smaller bid packages will result in a greater number of bids by locally owned small businesses.

(xii) The Administrator of Purchasing, upon approval of the County Mayor, may establish special insurance and bonding requirements for certified locally owned small businesses so long as they are not in conflict with the laws of the State of Tennessee.

(xiii) The Administrator of Purchasing, with the approval of the County Mayor, shall adopt and promulgate, and may from time to time, amend rules and regulations not inconsistent with the provisions of this ordinance, governing the purchase of goods and services from locally owned small business concerns to effectuate and implement the Locally Owned Small Business Purchasing Program within the intent of this ordinance.

(xiv) The Administrator of EOC shall, in conjunction with the Administrator of Purchasing, provide a written quarterly report to the Mayor and Board of Commissioners which shall include a summary of the purchases selected for this program, a listing of the contracts awarded to locally owned small businesses for the period, and the dollar amounts of each such contract, and the percentage which such contracts bear to the total amount of purchases for the period.

k.

DRUG-FREE WORKPLACE AFFIDAVIT

STATE OF _____

COUNTY OF _____

The undersigned, principal officer of _____, an employer of five (5) or i employees contracting with _____ County government to provide construction services states under oath as follows:

- 1. The undersigned is a principal officer of _____ (hereinafter referred to as the “Company”), and is duly authorized to execute this Affidavit on behalf of the Company.
- 2. The Company submits this Affidavit pursuant to T.C.A. § 50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9, of the *Tennessee Code Annotated*.
- 4. The Company is in compliance with T.C.A.~ 50-9-113. Further affiant saith not.

Principal Officer

STATE OF _____

COUNTY OF _____

Before inc personally appeared _____ with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that such person executed the foregoing affidavit for the purposes therein contained.

Witness my hand and seal at office this _____ day of _____ 20

Notary Public

My commission expires:

1.

GRATUITY DISCLOSURE FORM

Shelby County Ethics Commission

INSTRUCTIONS: This form is for all persons receiving any Shelby County Government contract, land use approval or financial grant money to report any gratuity that has been given, directly or indirectly, to any elected official, employee or appointee (including their spouses and immediate family members) who is involved in the decision regarding the contract, land use approval, or financial grant of money.

1. **NAME**

2. **DATE OF GRATUITY**

3. **NATURE AND PURPOSE OF THE GRATUITY**

4. **NAME OF THE OFFICIAL, EMPLOYEE, APPOINTEE, OR FAMILY MEMBER WHO RECEIVED THE GRATUITY**

5. **NAME OF THE PERSON OR ENTITY THAT PROVIDED THE GRATUITY**

6. **ADDRESS OF THE PERSON OR ENTITY THAT PROVIDED THE GRATUITY**

7. DESCRIPTION OF THE GRATUITY

8. COST OF THE GRATUITY (If cost is unknown and not reasonably discernible by the person giving the gratuity, then the person giving the gratuity shall report a good faith estimate of the cost of the gratuity.)

9. The information contained in this Gratuity Disclosure Form, and any supporting documentation or materials referenced herein or submitted herewith, is true and correct to the best of my knowledge, information and belief and affirm that I have not given, directly or indirectly, any gratuity to any elected official, employee or appointee (including spouse and immediate family members) that has not been disclosed and I affirm that I have not violated the provisions of the Shelby County Government Code of Ethics.

Signature

Date

Print Name

A copy of your completed form will be placed on the Shelby County Internet website.

m.

FORMS TO BE SUBMITTED

LOSB FORM A: MUST BE COMPLETED AND SUBMITTED IN YOUR BID ENVELOPE

LOSB FORM B: MUST BE COMPLETED, SUBMITTED WITH YOUR BID DOCUMENTING ALL LOSB'S TO BE UTILIZED, THE PERCENTAGE OF UTILIZATION AND THE INTENDED SCOPE OF THE WORK.

DRUG FREE WORKPLACE AFFIDAVIT - MUST BE COMPLETED AND SUBMITTED WITH YOUR BID.

GRATUITY DISCLOSURE FORM - MUST BE COMPLETED AND SUBMITTED WITH YOUR BID.

BID BOND- ALL BIDS MUST BE ACCOMPANIED BY A BANK CERTIFIED CHECK OF BANK DRAFT, LETTER OF CREDIT ISSUED BY ANY NATIONAL BANK OR APPROVED BID BOND FOR NOT LESS THAN 5% (PERCENT) OF THE AMOUNT OF THE BID. ALL PROPOSAL GUARANTEES SHALL BE MADE OUT TO THE COUNTY OF SHELBY.

NOTE: LOSB FORM C AND D WILL BE SUBMITTED BY THE SUCCESSFUL CONTRACTOR.

LOSB FORM C- MUST BE COMPLETED AND SUBMITTED BY EACH LOSB PROVIDING SUBCONTRACTED GOODS AND OR SERVICES CERTIFYING THAT THEY ARE PERFORMING THE WORK AND THAT IT IS A COMMERCIALY USEFUL FUNCTION.

LOSB FORM D-MUST BE COMPLETED AND SUBMITTED BY THE SUCCESSFUL CONTRACTOR EACH MONTH CERTIFYING ALL PAYMENTS MADE TO LOSB'S.

FAILURE TO SUBMIT THE REQUIRED FORMS MAY RESULT IN YOUR BID BEING REJECTED AS BEING IN NON-COMPLIANCE WITH BID REQUIREMENTS.

VIII. AWARD OF CONTRACT

- a. Proposers are advised that the lowest cost proposal will not necessarily be awarded the contract, as the selection will be based upon qualification criteria as deemed by the County and as determined by the selection committee and the County Mayor.

- b. **Scope of Work**

The County wishes to engage in a contractual relationship with the lowest responsive Contractor selected through the bid process.

- c. **Project Time Frame**

The Provider must be prepared to begin immediately upon receipt of a Notice to Proceed.

- d. **Reservation of Rights**

The County reserves the right, for any reason to accept or reject any one more proposals, to negotiate the term and specifications for the services provided, to modify any part of the RFP, or to issue a new RFP.

- e. **Selection Criteria**

Contract(s) will be awarded based on the lowest responsive proposals received. The contents of the proposal of the successful Bidders will become contractual obligations and failure to accept these obligations in a contractual agreement may result in cancellation of the award.

- f. **Additional Information and References**

Any additional information that would be helpful to the County evaluating your proposal, including a list of current and former clients with a similar profile to Shelby County should be submitted.

IX. NOTICE TO BIDDERS

Time and Place of Opening of Bids:

Request for Proposals for the improvements described herein will be received and opened at **THE OFFICE OF THE SHELBY COUNTY ADMINISTRATOR OF PURCHASING, Suite 900, SHELBY COUNTY ADMINISTRATION BUILDING, 160 NORTH MAIN, MEMPHIS, TENNESSEE 38103, at 4:00 pm, THURSDAY, MAY 22, 2014.**

NOTE: There will not be a public bid opening for this project.

Description of Work:

- a. The proposed work is officially known as: **CONSTRUCTION OF EQUIPMENT STORAGE BUILDING.**

Pre-Bid Meeting:

Bidders are encouraged to attend a **MANDATORY** pre-bid meeting to be held on Thursday, **May 8, 2014 at 2:30 am**, at the Shelby County Sheriff's Emergency Services and Reserve Building, 989 Dovecrest, Memphis, Tennessee 38134.

Instruction to Bidders:

- (a) The RFP can be downloaded from The Shelby county Government website locates at www.shelbycountyttn.gov and click the link "Department" at the top, then P for the Purchasing Department, then click on the link "Bids."
- (b) All bids must be accompanied by a bank cashier's check or bank draft, letter of credit issued by any national bank or certificate of deposit therein, duly assigned, or certified check or approved bid bond for not less than five (5) percent of the amount of the bid. All proposal guarantees shall be made out to the COUNTY OF SHELBY.
- (c) All bidders must be licensed by the Tennessee State Board of Licensing
- (d) General Contractors Evidence of this license must appear on the title page of the Proposal in the space provided, and also on the exterior of the sealed envelope. The envelope enclosing each bid must show the Contractor's name, license number, expiration date thereof, and license classification of the contractor(s) bidding for the prime contract and for the masonry, electrical, plumbing, heating, ventilation, and air conditioning subcontracts in

accordance with TCA 62-6-119. Lacking all of this information, the bid shall be rejected and returned to the bidder unopened.

EOC Requirements:

As a condition precedent to bidding, bidders shall have received a current “Equal Opportunity Compliance Eligibility Number” which must be attached to each bid submission. To receive an E.O.C. Eligibility Number, specific information must be received by the E.O.C. Department. To verify your E.O.C. Number or to receive information for obtaining a number, contact the E.O.C. Department, **901-222-1100**.

Use of Locally Owned Small Business (LOSB) participation on County projects is mandatory.

Bidders are encouraged to contact County-certified LOSB firms from the listing that can be obtained from Shelby County EOC department. Bidders may also provide the names of firms they believe would qualify as LOSB firms, by notifying the E.O.C. Department and filing the required forms. at least five (5) working days prior to the bid opening

A Locally Owned Small Business is defined as a sole proprietorship, corporation, partnership, or joint venture located within Shelby County and at least 51% owned, operated and managed by a Shelby County resident and having an average annual sale of \$5,000,000.00 or less over the past three (3) years.

Rejection of Bids:

The **COUNTY OF SHELBY** reserves the right to reject any and all proposals and to waive technicalities in any proposal.

BY ORDER OF: CLIFTON DAVIS

**PURCHASING
ADMINISTRATOR
SHELBY COUNTY
GOVERNMENT**

_____, 2014

DOCUMENT 00 41 13
BID FORM – STIPULATED SUM

To: Administrator of Purchasing
Shelby County Government
Suite 550
160 North Main St.
Memphis, TN 38103

Project: Shelby County Sheriff's Department Equipment Storage Building
989 Dovecrest Road

Date: _____

Submitted by: _____
(full name)

(full address) _____

1. OFFER

BASE BID - All Work not including the Additive Alternates listed on this bid form and not including the Contingency Allowance as indicated in the bid documents:

(\$ _____) State amount in both words and figures.

CONTINGENCY ALLOWANCE Fifteen percent (15%) of the Base Bid to the nearest whole dollar:

(\$ _____) State amount in both words and figures.

TOTAL BASE BID AMOUNT (Base Bid plus Contingency Allowance)

Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by John Pruett Architects for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

_____ dollars,

(\$ _____) in lawful money of the United States of America.

We have included the security Bid Bond as required by the Notice to Bidders. All applicable federal taxes are included and State of Tennessee and City of Memphis taxes are included in the Bid Sum.

ADDITIVE ALTERNATE BID ITEM NO. 1

This Bid Item includes the extension of the building length by 14'-0" to the north by duplication of garage bay between Column lines # 5 & #6.

(\$ _____) State amount in both words and figures.

CONTINGENCY ALLOWANCE

Fifteen percent (15%) of the Additive Alternate Bid Item No. 1 amount to the nearest whole dollar:

(\$ _____) State amount in both words and figures.

2. ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for ninety days from the bid closing date. If this bid is accepted by the Owner within the time period stated above, we will:

- Execute the Agreement within seven days of receipt of Notice of Award.
- Furnish the required bonds within seven days of receipt of Notice of Award. In the form described in Supplementary Conditions.
- Commence work within seven days after written Notice to Proceed.

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

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

3. CONTRACT TIME

If this Bid is accepted, we will: Complete the Work in ONE HUNDRED TWENTY (120) calendar days from Notice to Proceed. CONTRACTOR agrees to provide COUNTY an amount equal to 500 (\$) Dollars per day for liquidated damages for each consecutive calendar day required for the completion of the contract beyond the time stipulated.

4. ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.

- Addendum # _____ Dated _____

Addendum # _____ Dated _____

5. APPENDICES

The following documents are attached to and made a condition of the Bid:

LOSB Subcontractor & Supplier List

Drug-Free Workplace Affidavit

Bid security in form of Bid Bond

6. BID FORM SIGNATURES

The Corporate Seal of

(Bidder - print the full name of your firm)

was hereunto affixed in the presence of:

(Authorized signing officer Title)
(Seal)

(Authorized signing officer Title)
(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the jointventure in the appropriate form or forms as above.

END OF DOCUMENT

SECTION 00 50 00
CONTRACTING FORMS AND SUPPLEMENTS

Attached herein:

- BID BOND
- DRAFT COUNTY/CONTRACTOR AGREEMENT
- PERFORMANCE BOND
- LABOR AND MATERIAL PAYMENT BOND
- SHELBY COUNTY GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A310

Bid Bond

KNOW ALL MEN BY THESE PRESENTS, that we

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called the Principal, and

(Here insert full name and address or legal title of Surety)

a corporation duly organized under the laws of the State of
as Surety, hereinafter called the Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called the Obligee, in the sum of

Dollars (\$ _____),

for the payment of which sum well and truly to be made, the said Principal and the said Surety,
bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and
severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for

(Here insert full name, address and description of project)

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

Signed and sealed this _____

day of _____

19____

(Principal)

(Seal)

(Witness)

(Title)

(Surety)

(Seal)

(Witness)

(Title)

THIS IS A DRAFT ONLY!! ORIGINAL DOCUMENTS IN EXECUTED FORM ARE REQUIRED PRIOR TO COUNTY SIGNATURE. IT IS A MANDATORY REQUIREMENT THAT ALL DOCUMENTS WHICH ARE REQUIRED TO BE ATTACHED TO THIS AGREEMENT BE ATTACHED BEFORE SUBMITTAL TO SHELBY COUNTY FOR SIGNATURE. IF NOT, THE AGREEMENT WILL BE RETURNED FOR COMPLETION.

COUNTY/CONTRACTOR AGREEMENT

OWNER: SHELBY COUNTY GOVERNMENT
160 N. MAIN ST.
MEMPHIS, TN 38103

CONTRACTOR:

**ARCHITECT\
ENGINEER:**

THIS CONTRACT made and entered into this _____ day of _____, 20__, by and between SHELBY COUNTY GOVERNMENT, through its governing body and authorized representative, party of the first part, hereinafter referred to as "COUNTY," and _____, party of the second part, hereinafter referred to as "CONTRACTOR."

WITNESSETH

WHEREAS, the COUNTY issued Sealed Bid No. _____ for _____, hereinafter in this Contract referred to as "PROJECT".

WHEREAS, the said CONTRACTOR submitted a bid/proposal in accordance with bid specifications, a copy of which is attached hereto as Exhibit "A" and incorporated herein by reference, which bid was accepted by COUNTY.

NOW, THEREFORE, CONTRACTOR agrees and undertakes to **(describe work to be done)** in accordance with the Bid Specifications which are on file in the Shelby County Purchasing Department and which are incorporated herein by reference, and at the price quoted for said PROJECT by CONTRACTOR. Further, the parties agree that they will be governed by the Shelby County General Conditions of the Contract for work to be performed. The Contractor acknowledges that it has read and is familiar with the contents of said General Conditions, agrees to be bound thereby and has executed a copy of same at the place indicated thereon. A copy of said General Conditions is attached hereto as Exhibit "B" and incorporated fully herein by reference.

SECTION 1. CONTRACTOR'S RESPONSIBILITIES

1. CONTRACTOR shall perform all necessary work required by the contract documents for the satisfactory completion in full of the PROJECT.
2. CONTRACTOR shall coordinate all work with COUNTY through _____. Work shall be scheduled on a regular basis in as timely and orderly a manner as possible.
3. The CONTRACTOR shall give a Performance Bond and Labor and Material Bond, each equal to 100% of the amount of the Contract, with surety to be approved by the COUNTY, conditioned upon the full and faithful performance of all the terms and conditions of the Contract with special reference to paying in full in lawful money of the United States, all just and valid claims for material and labor entered into for the said work covered by this Contract. That further, this Contract shall not take effect until these Bonds have been executed and approved by the County.
4. The CONTRACTOR further agrees to provide insurance coverage of the type and in the amounts as required in section III, Specific Provision, paragraph 31.
5. The COUNTY shall pay the CONTRACTOR for the performance of the Contract _____ (\$)Dollars, subject to additions and deductions as provided in the contract documents.

6. The CONTRACTOR shall execute the entire work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others, within _____ (__) calendar days from the actual start date as specified in the written "Notice to Proceed."
7. All work by CONTRACTOR is to be performed in a manner satisfactory to COUNTY, and in accordance with the established customs, practices and procedures of COUNTY. CONTRACTOR is to periodically request sufficient conferences to insure that the work is being done by CONTRACTOR in a satisfactory manner in accordance with the wishes of COUNTY.

SECTION II. METHOD OF PAYMENT

1. CONTRACTOR shall provide an Application for Payment to be received by the Architect/Engineer not later than the 25th day of each month. COUNTY shall make payment to the CONTRACTOR not later than the 20th day of the following month. If an Application for Payment is received by the Architect/Engineer after the application date fixed above, payment shall be made by COUNTY not later than forty-five (45) days after receipt of the Application for Payment. If the CONTRACTOR submits an incorrect Application for Payment, payment date will be extended thirty (30) days from the date of correction.
2. Application for payment shall indicate the percentage of completion of each portion of the work as of the end of the period covered by the Application for Payment.
3. Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:
 - a. Take that portion of the contract sum properly allocable to completed work as determined by multiplying the percentage completion of each portion of the work by the total Contract Sum less retainage of five (5%) percent;
 - b. Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by COUNTY, suitably stored off the site at a location agreed upon in writing), less retainage of five (5%) percent;

- c. Subtract the aggregate of previous payments made by the COUNTY; and
 - d. Subtract amounts, if any, for which the Architect/Engineer has withheld or nullified a Certificate of Payment as provided in the General Conditions to Construction Contracts.
4. When all work embraced in this Contract has been fully and completely performed on the part of the CONTRACTOR, and accepted by the COUNTY, there shall be a statement by CONTRACTOR of the work done according to the terms herein, and the balance appearing to be due the CONTRACTOR out of funds applicable for payment for this work, excepting there from any sum that may be lawfully retained under the provisions of this Contract, Specifications, and General Conditions to Construction Contracts and all such funds as may be due the COUNTY.
 5. The COUNTY shall have the right, at its option, to discharge the CONTRACTOR for any breach of any provision of this Contract, and such discharge shall not affect the right of the COUNTY against sureties on the Bonds provided.
 6. It is further mutually agreed between the parties hereto that if at any time after the execution of this Contract and the Surety Bonds attached hereto for its faithful performance, the COUNTY shall deem the surety or sureties upon such bond inadequate to cover the performance of the work, the CONTRACTOR shall, at its expense, within five (5) days after the receipt of notice from the COUNTY so to do, furnish as additional bond or bonds, in satisfactory amount to the COUNTY. In such event, no further payment to the CONTRACTOR shall be deemed due under this Contract until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the COUNTY.
 7. CONTRACTOR further agrees to provide COUNTY an amount equal to _____ (\$) Dollars per day for liquidated damages for each consecutive calendar day required for the completion of the contract beyond the time stipulated. **(NOTE: If this paragraph is inapplicable, then N/A [not applicable] should be inserted in the applicable space.)**
 8. Other contract provisions, including but not limited to

insurance provisions may be required to enter into a contract with Shelby County Government.

SECTION III. SPECIFIC PROVISIONS

The parties further agree as follows:

1. CONTROL

All Services by the CONTRACTOR will be performed in a manner satisfactory to the COUNTY, and in accordance with the generally accepted business practices and procedures of the COUNTY.

2. CONTRACTOR'S PERSONNEL

The CONTRACTOR certifies that it presently has adequate qualified personnel to perform all Services required under this Contract. All work performed during the Term of this Contract will be supervised by the CONTRACTOR. The CONTRACTOR further certifies that all of its employees assigned to serve the COUNTY have such knowledge and experience as required to perform the duties assigned to them. Any employee of the CONTRACTOR who, in the opinion of the COUNTY, is incompetent, or whose conduct becomes detrimental to the work, shall immediately be removed from association with the Services under this Contract.

3. INDEPENDENT STATUS

a. Nothing in this Contract shall be deemed to represent that the CONTRACTOR, or any of the Contractor's employees or agents, are the agents, representatives, or employees of the COUNTY. The CONTRACTOR will be an independent CONTRACTOR over the details and means for performing the Services under this Contract. Anything in this Contract which may appear to give the COUNTY the right to direct the CONTRACTOR as to the details of the performance of the Services under this Contract or to exercise a measure of control over the CONTRACTOR is solely for purposes of compliance with local, state and federal regulations and means that the CONTRACTOR will follow the desires of the COUNTY only as to the intended results of the scope of this Contract.

- b. It is further expressly agreed and understood by CONTRACTOR that neither it nor its employees or agents are entitled to any benefits which normally accrue to employees of the COUNTY; that CONTRACTOR has been retained by the COUNTY to perform the Services specified herein (not hired) and that the remuneration specified herein is considered fees for the Services performed (not wages) and that invoices submitted to the COUNTY by CONTRACTOR for the Services performed shall be on the Contractor's letterhead.

4. REPORTS

CONTRACTOR shall prepare and submit quarterly reports of its activities, funded under this Contract, to the originating department and the Contract Administration Department of the COUNTY. The reports shall include an itemization of the use of County's funds, inclusive of specific Services delivered. Any such reports provided to the COUNTY shall be prepared with the understanding that the COUNTY may make such reports available to the public. The quarterly reports and all books of account and financial records that are specific to the work performed in accordance with this Contract may be subject to audit by the Director of the Division of Administration and Finance of the COUNTY. The COUNTY shall have the right to withhold future disbursement of funds under this Contract and any future Contracts until this provision has been met.

5. TERMINATION OR ABANDONMENT

- a. It shall be cause for the immediate termination of this Contract if, after its execution, the COUNTY determines that:
 - i) Either the CONTRACTOR or any of its principals, partners or corporate officers, if a corporation, including the corporation itself, has plead nolo contendere, or has plead or been found guilty of a criminal violation, whether state or federal, involving, but not limited to, governmental sales or purchases, including but not limited to the rigging of bids, price fixing, or any other collusive and illegal activity pertaining to bidding and governmental contracting; or
 - ii) CONTRACTOR has subcontracted, assigned, delegated, transferred its rights, obligations or interests

under this Contract without the County's consent or approval; or

iii) CONTRACTOR has filed bankruptcy, become insolvent or made an assignment for the benefit of creditors, or a receiver, or similar officer has been appointed to take charge of all or part of CONTRACTOR assets.

b. The COUNTY may terminate the Contract upon five (5) days written notice by the COUNTY or its authorized agent to the CONTRACTOR for Contractor's failure to provide the Services specified under this Contract.

c. This Contract may be terminated by either party by giving thirty (30) days written notice to the other, before the effective date of termination (the "Termination Date"). In the event of such termination, the CONTRACTOR shall be paid for all Services rendered prior to the Termination Date, provided the CONTRACTOR shall have delivered to COUNTY such statements, accounts, reports and other materials as required under this Contract; however, CONTRACTOR shall not be compensated for any anticipatory profits that have not been earned as of the date of the Termination Date. All Services completed by CONTRACTOR prior to the Termination Date shall be documented and tangible work documents shall be transferred to and become the sole property of the COUNTY prior to payment for the Services rendered.

d. Notwithstanding the above or any section herein to the contrary, CONTRACTOR shall not be relieved of liability to the COUNTY for damages sustained by the COUNTY by virtue of any breach of the Contract by CONTRACTOR and the COUNTY may withhold any payments to CONTRACTOR for the purpose of setoff until such time as the exact amount of damages due the COUNTY from CONTRACTOR is determined.

6. COMPENSATION FOR CORRECTIONS

No compensation shall be due or payable to CONTRACTOR pursuant to this Contract for any Contractor's Services performed by the CONTRACTOR in connection with effecting of corrections to the design of the Services, when such corrections are required as a direct result of negligence by the CONTRACTOR to properly fulfill any of his obligations as set forth in this Contract.

7. SUBCONTRACTING, ASSIGNMENT OR TRANSFER

- a. Any subcontracting, assignment, delegation or transfer of all or part of the rights, responsibilities, or interest of either party to this Contract is prohibited unless by written consent of the other party. No subcontracting, assignment, delegation or transfer shall relieve the CONTRACTOR from performance of the Services under this Contract. The COUNTY shall not be responsible for the fulfillment of the Contractor's obligations to its transferors or subcontractors.
- b. Upon the request of the other party, the subcontracting, assigning, delegating or transferring party shall provide all documents evidencing the subcontract, assignment, delegation or transfer.

8. CONFLICT OF INTEREST

The CONTRACTOR covenants that it has no public or private interest, and will not acquire directly or indirectly any interest, which would conflict in any manner with the performance of the Services. The CONTRACTOR warrants that no part of the total Contract Fee shall be paid directly or indirectly to any officer or employee of the COUNTY as wages, compensation, or gifts in exchange for acting as officer, agent, employee, subcontractor or consultant to the CONTRACTOR in connection with any work contemplated or performed relative to this Contract.

9. CONTINGENT FEES

The CONTRACTOR warrants that it has not employed or retained any company or person other than a bona fide employee working solely for the CONTRACTOR, to solicit or secure this Contract, and that it has not paid or agreed to pay any company or person, other than a bona fide employee working solely for the CONTRACTOR any fee, commission, percentage, brokerage fee, gift, or any other consideration contingent upon or resulting from the award or making of this Contract. For breach or violation of this warranty, the COUNTY will have the right to recover the full amount of such fee, commission, percentage, brokerage fee, gift, or other consideration.

10. EMPLOYMENT OF COUNTY WORKERS

The CONTRACTOR will not engage, on a full, part-time, or any other basis during the Term of the Contract, any professional or technical personnel who are or have been at any time during

the Term of the Contract in the employ of the COUNTY.

11. ACCESS TO RECORDS

During all phases of the work and Services to be provided hereunder, CONTRACTOR agrees to permit duly authorized agents and employees of the COUNTY to enter Contractor's offices for the purpose of inspections, reviews, and audits during normal working hours. Reviews may also be accomplished at meetings that are arranged at mutually agreeable times and places. The CONTRACTOR will maintain all books, documents, papers, accounting records, and other evidence pertaining to the Fee paid under this Contract and make such materials available at their offices at all reasonable times during the Term of this Contract and for three (3) years from the date of payment under this Contract for inspection by the COUNTY or by any other governmental entity or agency participating in the funding of this Contract, or any authorized agents thereof. Copies of said records shall be furnished to the COUNTY upon request.

12. ARBITRATION

Any dispute concerning a question of fact in connection with the work not disposed of by agreement between the CONTRACTOR and the COUNTY will be referred to the Shelby County Contract Administrator or its duly authorized representative, whose decision regarding same will be final.

13. RESPONSIBILITIES FOR CLAIMS AND LIABILITIES

- a. CONTRACTOR shall indemnify, defend, save and hold harmless the COUNTY, and its elected officials, officers, employees, agents, assigns, and instrumentalities from and against any and all claims, liability, losses or damages—including but not limited to Title VII and 42 USC 1983 prohibited acts—arising out of or resulting from any conduct; whether actions or omissions; whether intentional, unintentional, or negligent; whether legal or illegal; or otherwise that occur in connection with or in breach of this Contract or in the performance of the Services hereunder, whether performed by the CONTRACTOR its subcontractors, agents, employees or assigns. This indemnification shall survive the termination or conclusion of this Contract.
- b. CONTRACTOR expressly understands and agrees that any insurance protection required by this Contract or

otherwise provided by the CONTRACTOR shall in no way limit the responsibility to indemnify, defend, save and hold harmless the COUNTY or its elected officials, officers, employees, agents, assigns, and instrumentalities as herein provided.

- c. The COUNTY has no obligation to provide legal counsel or defense to CONTRACTOR or its subcontractors in the event that a suit, claim or action of any character is brought by any person not a party to this agreement against CONTRACTOR as a result of or relating to performance of the Services under this Contract.
- d. Except as expressly provided herein, the COUNTY has no obligation for the payment of any judgment or the settlement of any claims against CONTRACTOR as a result of or relating to performance of the Services under this Contract.
- e. CONTRACTOR shall immediately notify the COUNTY of any claim or suit made or filed against CONTRACTOR or its subcontractors regarding any matter resulting from or relating to Contractor's performance of the Services under this Contract and will cooperate, assist and consult with the COUNTY in the defense or investigation thereof.

14. GENERAL COMPLIANCE WITH LAWS

- a. The CONTRACTOR certifies that it is qualified or will take steps necessary to qualify to do business in the State of Tennessee and that it will take such action as, from time to time, may be necessary to remain so qualified and it shall obtain, at its expense all licenses, permits, insurance, and governmental approvals, if any, necessary to the performance of the Services under this Contract.
- b. The CONTRACTOR is assumed to be familiar with and agrees that at all times it will observe and comply with all federal, state, and local laws, ordinances, and regulations in any manner affecting the performance of the Services. The preceding shall include, but is not limited to, compliance with all Equal Employment Opportunity laws, the Fair Labor Standards Act, Occupational Safety and Health Administration (OSHA) requirements, and the Americans with Disabilities Act (ADA).

c. This Contract will be interpreted in accordance with the laws of the State of Tennessee. By execution of this Contract, the CONTRACTOR agrees that all actions, whether sounding in contract or in tort, relating to the validity, construction, interpretation and enforcement of this Contract will be instituted and litigated in the courts of the State of Tennessee, located in Shelby County, Tennessee, and in no other. In accordance herewith, the parties to this Contract submit to the jurisdiction of the courts of the State of Tennessee located in Shelby County, Tennessee.

15. NON-DISCRIMINATION

The CONTRACTOR hereby agrees, warrants, and assures compliance with the provisions of Title VI and VII of the Civil Rights Act of 1964 and all other federal statutory laws which provide in whole or in part that no person shall be excluded from participation or be denied benefits of or be otherwise subjected to discrimination in the performance of this Contract or in the employment practices of the CONTRACTOR on the grounds of handicap and/or disability, age, race, color, religion, sex, national origin, or any other classification protected by federal, Tennessee State Constitutional or statutory law. The CONTRACTOR shall upon request show proof of such non-discrimination and shall post in conspicuous places available to all employees and applicants notices of non-discrimination.

16. ENTIRE AGREEMENT

This Contract represents the entire and integrated agreement between the parties and supersedes all prior negotiations, representations or agreements, whether oral or written.

17. AMENDMENT

This Contract may be modified or amended only by written instrument signed by both parties.

18. SEVERABILITY

If any provision of this Contract is held to be unlawful, invalid or unenforceable under any present or future laws, such provision shall be fully severable; and this Contract shall then be construed and enforced as if such unlawful, invalid or unenforceable provision had not been a part hereof. The remaining provisions of this Contract shall remain in full

force and effect and shall not be affected by such unlawful, invalid or unenforceable provision or by its severance here from. Furthermore, in lieu of such unlawful, invalid, or unenforceable provision, there shall be added automatically as a part of this Contract a legal, valid and enforceable provision as similar in terms to such unlawful, invalid or unenforceable provision as possible.

19. NO WAIVER OF CONTRACTUAL RIGHT

No waiver of any term, condition, default, or breach of this Contract, or of any document executed pursuant hereto, shall be effective unless in writing and executed by the party making such waiver; and no such waiver shall operate as a waiver of either (a) such term, condition, default, or breach on any other occasion or (b) any other term, condition, default, or breach of this Contract or of such document. No delay or failure to enforce any provision in this Contract or in any document executed pursuant hereto shall operate as a waiver of such provision or any other provision herein or in any document related hereto. The enforcement by any party of any right or remedy it may have under this Contract or applicable law shall not be deemed an election of remedies or otherwise prevent such party from enforcement of one or more other remedies at any time.

20. MATTER TO BE DISREGARDED

This title of the several sections, subsections, and paragraphs set forth in this Contract are inserted for convenience of reference only and shall be disregarded in construing or interpreting any of the provisions of this Contract.

21. SUBJECT TO FUNDING

This Contract is subject to annual appropriations of funds by the Shelby County Government. In the event sufficient funds for this Contract are not appropriated by Shelby County Government for any of its fiscal period during the Term hereof, then this Contract will be terminated. In the event of such termination, the CONTRACTOR shall be entitled to receive just and equitable compensation for any satisfactory work performed as of the Termination Date.

22. TRAVEL EXPENSES (If Applicable)

All travel expenses payable under this Contract shall be in

accordance with the County Travel Policy and Procedures. This includes advance written travel authorization, submission of travel claims, documentation requirements, and reimbursement rates. No travel advances will be made by the County.

23. PERFORMANCE AND LABOR AND MATERIALS BONDS

CONTRACTOR will provide COUNTY within ten (10) days from inception date of this Contract a Performance and Labor and Materials Bond each in the amount of 100% of the Contract price for each year that this contract is in effect. Said Bonds may be pro-rated for the initial year in the event that this period of time is less than a full twelve (12) month period.

24. NON-LIABILITY FOR CONTRACTOR EMPLOYEE TAXES

Neither CONTRACTOR nor its personnel are County's employees, and COUNTY shall not take any action or provide Contractor's personnel with any benefits and shall have no liability for the following:

- a. Withholding FICA (Social Security) from Contractor's payments;
- b. Making state or federal unemployment insurance contributions on behalf of CONTRACTOR or its personnel;
- c. Withholding state and federal income tax from payment to CONTRACTOR;
- d. Making disability insurance contributions on behalf of CONTRACTOR;
- e. Obtaining workers' compensation insurance on behalf of CONTRACTOR or Contractor's personnel.

25. INCORPORATION OF OTHER DOCUMENTS

- a. CONTRACTOR shall provide Services pursuant to this Contract in accordance with the terms and conditions set forth within the Shelby County Request for Proposals/Bids as well as the Response of CONTRACTOR thereto, all of which are maintained on file within the Shelby County Purchasing Department and incorporated herein by reference.
- b. It is understood and agreed between the parties that in

the event of a variance between the terms and conditions of this Contract and any amendment thereto and the terms and conditions contained either within the Request for Proposals/Bids or the Response thereto, the terms and conditions of this Contract as well as any amendment shall take precedence and control the relationship and understanding of the parties.

26. CONTRACTING WITH LOCALLY OWNED SMALL BUSINESSES

The CONTRACTOR shall take affirmative action to assure that Locally Owned Small Businesses that have been certified by the COUNTY are utilized when possible as sources of supplies and equipment, construction and services.

27. RIGHT TO REQUEST REMOVAL OF Contractor's EMPLOYEES

The COUNTY may interview the personnel CONTRACTOR assigns to County's work. COUNTY shall have the right, at any time, to request removal of any employee(s) of CONTRACTOR, whom COUNTY deems to be unsatisfactory for any reason. Upon such request, CONTRACTOR shall use all reasonable efforts to promptly replace such employee(s) with substitute employee(s) having appropriate skills and training.

28. INCORPORATION OF WHEREAS CLAUSES

The foregoing whereas clauses are hereby incorporated into this Contract and made a part hereof.

29. DISCLOSURE OF REPORTS, DATA OR OTHER INFORMATION

Notwithstanding anything to the contrary contained herein or within any other document supplied to COUNTY by CONTRACTOR, CONTRACTOR understands and acknowledges that COUNTY is a governmental entity subject to the laws of the State of Tennessee and that any reports, data or other information supplied to COUNTY by CONTRACTOR due to Services performed pursuant to this Contract is subject to being disclosed as a public record in accordance with the laws of the State of Tennessee.

30. ORGANIZATION STATUS AND AUTHORITY

a. CONTRACTOR represents and warrants that it is a corporation, limited liability company, partnership, or other entity duly organized, validly existing and in good standing under the laws of the state of Tennessee; it has

the power and authority to own its properties and assets and is duly qualified to carry on its business in every jurisdiction wherein such qualification is necessary.

- b. The execution, delivery and performance of this Contract by the CONTRACTOR has been duly authorized by all requisite action and will not violate any provision of law, any order of any court or other agency of government, the organizational documents of CONTRACTOR, any provision of any indenture, agreement or other instrument to which CONTRACTOR is a party, or by which Contractor's respective properties or assets are bound, or be in conflict with, result in a breach of, or constitute (with due notice or lapse of time or both) a default under any such indenture, agreement or other instrument, or result in the creation or imposition of any lien , charge or encumbrance of any nature whatsoever upon any of the properties or assets.

31. INSURANCE REQUIREMENTS

- a. The CONTRACTOR shall purchase and maintain, in a company or companies licensed to do business in the State of Tennessee, such insurance as will protect the County from claims which may arise out of or result from the Contractor's operations under the Contract, whether such operations are performed by himself or by any subcontractors or by anyone directly or indirectly employed by any of them, or by anyone for whose acts the CONTRACTOR or subcontractor may be liable.
- b. The insurance required shall be written for not less than any limits of liability specified or required by law, whichever is greater. Shelby County Government, its elected officials, appointees and employees will be named as additional insured. All policies will provide for thirty (30) days written notice to COUNTY of cancellation or material change in coverage provided. The Contractor shall immediately notify Shelby county Government, Contract Administration, 160 N. Main Street, Suite 550, Memphis, Tennessee of cancellation or changes in any of the insurance coverage required. The CONTRACTOR will maintain throughout the life of this Contract insurance, through insurers rated A- or better by A.M. Best, in the following minimum requirements:

- i) Commercial General Liability Insurance-
 \$1,000,000.00 limit per occurrence for bodily
 injury and property damage/\$1,000,000.00 personal
 and advertising injury/\$2,000,000.00 General
 Aggregate/\$2,000,000.00 Products-Completed
 Operations Aggregate. Shelby County Government, its
 elected officials, appointees, employees,
 volunteers, and members of boards, agencies, and
 commissions will be listed as additional insured
 regarding operations under this program. The
 insurance shall include coverage for the following:
 - a) Premises/Operations
 - b) Products/Completed Operations
 - c) Personal Injury
 - d) XCU coverage, where applicable
 - e) Contractual Liability
 - f) Independent Contractors
 - g) Broad Form Property Damage
 - h) When contract is awarded, the Contractor will
 be required to provide the County with a copy
 of the additional insured endorsement.

- ii) Business Automobile Liability Insurance -
 \$1,000,000.00 each accident for bodily injury and
 property damage. Coverage is to be provided on all:
 - a) Owned/Leased Autos
 - b) Non-owned Autos
 - c) Hired Autos

- iii) Workers Compensation and Employer's liability
 Insurance - All owners, sole proprietors, partners,
 and officers will elect to be covered by workers
 compensation coverage, regardless of requirement by
 Tennessee state status. Policy is to be
 specifically endorsed to include these individuals
 for coverage. Coverage is to include:
 - a. Employers Liability Coverage for \$1,000,000 per
 accident;
 - b. Employers Liability Disease each employee
 \$1,000,000; and
 - c. Employers Liability Disease Policy Limit
 \$1,000,000

Note: The Contractor's workers compensation policy will include the following endorsement: WAIVER OF OUR RIGHT TO RECOVER FROM OTHERS ENDORSEMENT: (form WC 00 03 13) A completed copy of this form will be included in documents provided to Shelby County Government by Provider's insurance company.

- iv) Builders Risk Insurance or Installation Floater (as applicable) for project. - All risk coverage in the amount of replacement cost of the structure/equipment, which is to be built or installed.
- c. CONTRACTOR shall provide County with a current copy of the Certificate of Insurance at the time of contracting and shall maintain said insurance during the entire Contract period as well as provide renewal copies on each anniversary date. The certificate holder is to read:

Shelby County Government
Purchasing Department
160 N. Main, Suite 550
Memphis, TN 38103

- d. Self insured retentions or deductibles of \$25,000 or over per loss or claims must be reviewed and agreed to by Shelby County Government prior to commencement of work under this program.

All policies will provide for 30 day written notice to Shelby County of cancellation of coverage provided. Ten (10) days notice applicable to non-payment of premium. If insurer is not required by the policy terms and conditions to provide written notice of cancellation to Shelby County, the Contractor//Contractor will provide immediate notice to Shelby County.

32. NOTICE

Any notices required or permitted to be given under the provisions of this Contract shall be effective only if in writing and delivered either in person to the County's authorized agent or by First Class or U.S. Mail to the addresses set forth in the Contract, or to such other person or address as either party may designate in writing and deliver as herein provided.

33. HIPAA (If applicable)

CONTRACTOR warrants to the COUNTY and State that it is familiar with the requirements of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and its accompanying regulations, and will comply with all applicable HIPAA requirements in the course of this Contract. CONTRACTOR warrants that it will cooperate with the COUNTY and State in the course of performance of the Contract so that all parties will be in compliance with HIPAA, including cooperation and coordination with COUNTY and State privacy officials and other compliance officers required by HIPAA and its regulations. CONTRACTOR will sign any documents that are reasonably necessary to keep the State and the COUNTY in compliance with HIPAA, including, but not limited to, business associate agreements.

It is agreed that the following documents are made a part of and incorporated fully into this construction Contract:

1. Performance Bond
2. Labor and Material Bond
3. Insurance Certificate
4. Bid Specifications (SB #_____, _____)
5. Contractor's Bid/Proposal (Exhibit "A")
6. General Conditions to Contract (Exhibit "B")
7. List of subcontractors who will be performing work on project with attached required information per Exhibit "C"

NOTE: THE ABOVE DOCUMENTS MUST BE ATTACHED BEFORE EXECUTION OF THIS AGREEMENT BY SHELBY COUNTY.

THE AMERICAN INSTITUTE OF ARCHITECTS



AIA Document A311

Labor and Material Payment Bond

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENTS: that _____ (Here insert full name and address or legal title or contractor)

as Principal, hereinafter called Principal, and, _____ (Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto _____ (Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the

amount of _____ (Here insert a sum equal to at least one-half of the contract price)

Dollars (\$

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Principal has by written agreement dated _____ 19 _____ entered into a contract with Owner for _____ (Here insert full name, address and description of project)

in accordance with Drawings and Specifications prepared by _____ (Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

LABOR AND MATERIAL PAYMENT BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimants work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial

Signed and sealed this

(W(nc~s)
(Vvilnss)

day of

accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

	19
<i>(Principal)</i>	
<i>(Tillt)</i>	
<i>(Surt'ly)</i>	
	(Seal)

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A311

Performance Bond



KNOW ALL MEN BY THESE PRESENTS: that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Contractor, and,

(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Owner, in the amount of

Dollars (\$ _____),

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

Contractor has by written agreement dated _____
(Here insert full name, address and description of project)

19 _____ entered into a contract with Owner for

in accordance with Drawings and Specifications prepared by

(Here insert full name and address or legal title of Architect)

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

PERFORMANCE BOND

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

1) Complete the Contract in accordance with its terms and conditions, or

2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of

defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this

day of

20

SECTION 01 11 13
SUMMARY OF THE WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Project Summary
- B. Contractor's Use of Site and Premises
- C. Owner Occupancy
- D. Contracts
- E. Additive Alternates

1.2 PROJECT SUMMARY

A. The "Project," of which the "Work" of this Contract is a part, is titled the Shelby County Sheriff's Department Equipment Storage Building. It includes the removal and disposal of a portion of an existing asphalt paved parking area and related parking lot accessories, site preparation and existing utility infrastructure extensions and related work to supplement the construction of a new 5000 sf +/- single story pre engineered steel building. The Project address is 989 Dovecrest Road, Memphis, Tennessee 38134.

B. The "Work" of this Contract is defined in the Contract Documents to include the entire Project, inclusive of Owner Selected Additive Alternates. The Shelby County General Conditions of the Contract for construction are made a part of this Project Manual as if fully included herein.

C. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, the Shelby County General Conditions of the Contract for construction, other Sections in Division 1 of these Specifications. It is the Contractors' responsibility to familiarize themselves with these documents prior to submitting a bid for the Work.

1.3 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limit use of site and premises to allow:

- 1. Uninterrupted Owner occupancy and use of the facility.
- 2. Use of site and premises by the public.
- 3. Unobstructed public paths of egress connecting the building to parking areas.
- 4. Unobstructed fire lanes, fire hydrants, and emergency vehicle access ways.

B. Before beginning work, the roofing contractor must secure approval from the Architect for the following:

- 1. Areas permitted for personnel parking.
- 2. Access to the site.
- 3. Areas permitted for storage of materials and debris.
- 4. Areas permitted for the location of cranes, hoists and chutes for loading and unloading materials to and from the roof.

1.4 OWNER OCCUPANCY

- A. The Owner will occupy the premises during the entire period of construction.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.
- D. Utilities may not be disrupted at any time during the project duration.

1.5 CONTRACTS

- A. Basis of the Contract for Construction will be Competitive Bid (Base Bid Amount with fifteen percent (15%) Construction Contingency in addition to the Base Bid amount for a total combined Lump Sum Amount).
- B. Contractor Qualifications: The Prime Contractor will hold a current Contractor's license in the State of Tennessee with a Classification of BC-B, and will meet all requirements for doing business with Shelby County Government per Division 0 of these Specifications.

1.6 ADDITIVE ALTERNATES

- A. The Project scope includes one Additive Alternate Bid Item. The Additive Alternate Bid Item should be listed on the Bid Form as a separate line item and not included in the Base Bid amount. The Additive Alternate Bid Item should also list a separate fifteen percent (15%) Construction Contingency amount. In addition to the Base Bid scope of work, the Owner may or may not choose to include the Additive Alternate Bid Item.

The Additive Alternate Bid Item is as follows:

1. Additive Alternate Bid Item No. 1:

Increase length of building 14'-0" to the north by duplicating garage bay shown on Floor Plan between column lines #5 & #6.

PART 2 – PRODUCTS (Not Used.)

PART 3 – EXECUTION(Not Used.)

END OF SECTION

SECTION 01 11 20

SHELBY COUNTY GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

1.01 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

A. The Shelby County General Conditions of the Contract for Construction, are made a part of the Project Manual.

1. The Contractor, his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor shall be bound by these General Conditions as if repeated in each Section of this Project Manual.
2. The failure on the part of the Contractor to familiarize himself or examine these Documents will in no way relieve him or her of their responsibilities and conditions set forth herein.

END OF SECTION

**SHELBY COUNTY GENERAL CONDITIONS OF THE
CONTRACT FOR CONSTRUCTION**

Rev. 5/24/99

constcnd.doc

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE I CONTRACT DOCUMENTS

1.1 Definitions

1.1.1 The Contract Documents

The Contract Documents consist of the Owner-Contractor Agreement, the conditions of the Contract (General, Supplementary and other conditions), the Drawings, the Specifications, and all Addenda issued prior to and all modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Architect pursuant to Subparagraph 2.2.8, or (4) a written order for a minor change in the Work issued by the Architect pursuant to Paragraph 12.3. The Contract Documents include Bidding Documents such as the Advertisement or invitation to Bid, the Instructions to Bidders, sample forms, the Contractor's Bid, or portions of Addenda relating to any of these, and other documents specifically enumerated in the Owner-Contractor Agreement.

1.1.2 The Contract

The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Subparagraph 1.1.1. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Architect and the Contractor, but the Architect shall be entitled to performance of obligations intended for his benefit, and to enforcement thereof. Nothing contained in the Contract Documents shall create any contractual relationship between the Owner or the Architect or any Subcontractor or sub-subcontractor.

1.1.3 The Work

The Work comprises the completed construction required by the contract Documents and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

1.1.4 The Project

The Project is the total construction of which the Work performed under these Contract Documents may be the whole or a part.

1.2 Execution Correlation and Intent

1.2.1 The Contract Documents shall be signed in not less than four originals by the Owner and Contractor. If either Owner or Contractor or both do not sign the Conditions of the Contract, Drawings, Specifications, or any of the other Contract Documents, the Architect shall identify such Documents.

1.2.2 By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not specifically set forth in the Contract Documents will not be required unless it is consistent with work that is specifically set forth in the Contract Documents or is reasonably inferable from the Contract Documents as being necessary to produce the intended results. Words and abbreviations, which have well-known technical or trade meanings, are used in the Contract Documents in accordance with such recognized meanings.

1.2.4 The organization of the Specifications into divisions, sections, and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Sub-contractors or in establishing the extent of Work to be performed by any trade.

1.3 Ownership and Use of Documents

1.3.1 All Drawings, Specifications, and copies thereof furnished by the Architect are the property of the Owner. They are to be used only with respect to this Project and are not to be used on any other project. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Architect on request at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with

the Project is not to be construed as publication in derogation of the Architect's common law copyright or other reserved rights. The Architect will furnish, free of charge, to

Initial _____

the Contractor sufficient sets of Contract Documents to execute the Work not to exceed ten (10). The Contractor may purchase additional sets by paying reproduction costs.

ARTICLE II ARCHITECT

2.1 Definition

2.1.1 The Architect is the person lawfully licensed to practice Architecture, or any entity lawfully practicing Architecting identified as such in the Owner-Contractor Agreement, and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Architect means the Architect or his authorized representative.

2.2 Administration of the Contract

2.2.1 The Architect will provide administration of the Contract as hereinafter described.

2.2.2 The Architect will be the Owner's representative during construction and until final payment is due. The Architect will advise and consult with the Owner. The Owner's instructions to the Contract shall be forwarded through the Architect. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument signed by the Owner.

2.2.3 The Architect will visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. On the basis of his on-site observations as an Architect, he will keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work of the Contractor.

2.2.4 The Architect will not be responsible for and will not have control or charge of construction means, methods, techniques or procedures, or for safety precautions and programs in connection with the Work, and he will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Architect will not be responsible for or have

control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.

Initial _____

2.2.5 The Architect shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so the Architect may perform his functions under the contract documents.

2.2.6 Based on the Architects observations and an evaluation of the Contractor's Applications for Payment, the Architect will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts as provided in Paragraph 9.4.

2.2.7 The Architect will render interpretations necessary for the proper execution or progress of the Work, with reasonable promptness and in accordance with any time limit agreed upon so as to cause no delay the Project. Either party to the Contract may make written request to the Architect for such interpretations.

2.2.8 All interpretations and decisions of the Architect shall be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings.

2.2.9 The Architects decision in matters relating to artistic effect will be final if consistent with the intent of the Contract Documents. The Architect shall rule on all claims and disputes that relate to the interpretation of the Contract Documents.

2.2.10 The Architect will have authority to reject Work, which does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the Work in accordance with Subparagraph 7.7.2 whether or not such Work is then fabricated, installed or completed. In the event the Architect determines that any Work deleted by the Contractor should have been performed by the Contractor under the Contract Documents, he shall issue a final determination that the Contractor shall proceed with the Work as directed by the Architect, and the Contractor shall proceed with the Work even if he is in disagreement with the decision of the Architect.

2.2.11 The Architect will review and approve or take other appropriate action under Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for conformance with the design concept of the Work and with the information given in the Contract Documents. Such action shall be taken with reasonable

promptness so as to cause no delay. The Architects approval of a specific item shall not indicate approval of an assembly of which the item is a component.

Initial _____

2.2.12 The Architect will prepare Change Orders in accordance with Article 12 and will have the authority to order minor changes in the Work as provided in Subparagraph 12.3.

2.2.13 The Architect will conduct inspections to determine the dates of Substantial Completion and completion will receive and forward to the Owner for the Owner's review written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a Final Certificate for Payment upon compliance with the requirements of Paragraph 9.8.

ARTICLE III OWNER

3.1 Definition

3.1.1 The Owner is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Owner, or his authorized representative.

3.2 Information and Services Required of the Owner

3.2.1 The Owner or Architect shall furnish all surveys describing the physical characteristics, legal limitations, and utility locations for the site of the Project, and a legal description of the site.

3.2.2 Except as provided in Subparagraph 4.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments, and charges required for the construction, use, or occupancy of permanent structures or for permanent changes in existing facilities.

3.2.3 Information or services under the Owner control shall be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.

3.2.4 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, all copies of Drawings and Specifications reasonably necessary for the execution of the Work.

3.2.5 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Work by Owner or by Separate Contractors,

Payments and Completion and Insurance in Article 6, 9 and 11, respectively.

Initial _____

3.3 Owner Right to Stop the Work

3.3.1 If the Contractor fails to correct defective Work as required by Paragraph 13.2 or persistently fails to carry out the Work in accordance with the Contract Documents, the Owner may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. Any such order to the Contractor shall be in writing.

3.4 Owner Right to Carry Out the Work

3.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within two (2) days after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy it may have, make good and correct such deficiencies with its own forces or with the forces of another contractor. In such case, an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect additional services made necessary by such default, neglect, or failure. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

3.4.2 The Owner shall have access to the Project at all times.

ARTICLE IV
CONTRACTOR

4.1 Definition

4.1.1 The Contractor is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.

4.2 Review of Contract Documents

4.2.1 The Contractor shall carefully study and compare the

Contract Documents and shall at once report to the Architect any error, inconsistency or omission he may discover.

Initial _____

4.3 Supervision and Construction Procedures

4.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the Contract.

4.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor.

4.3.3 The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents by either the activities or duties of the Architect in his administration of the Contract, or by inspection, tests, or approvals required or performed under Paragraph 7.7 by persons other than the Contractor.

4.4 Labor and Materials

4.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

4.4.2 The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him.

4.4.3 When a material, equipment, or system is specified or approved in an addendum, by the name of one or more manufacturers, such material, equipment, or system shall form the basis of the contract. If Contractor desires to use another material, equipment, or system in lieu thereof, he shall request approval in writing and shall submit samples and data as required for the Architect's consideration. The Architect and Owner will be the final judge for the acceptance or the substitution. No Substitution shall be made without authority in writing from the Architect.

4.4.4 By making requests for substitutions based on

Subparagraph 4.4.3 above, the Contractor:

Initial _____

- .1 represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
- .2 represents that he will provide the same warranty for the substitute that is required by the Contract Documents for that specified.
- .3 certifies that the cost data presented is complete and includes all related costs and excludes the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently became apparent; and
- .4 will coordinate the installation of the accepted substitute, making such changes at no additional cost to Owner as may be required for the Work to be complete in all respects.

4.4.5 The General Contractor shall disclose the existence and extent of financial interests, whether direct or indirect, he has in subcontractors and material suppliers, which he may propose for this Project.

4.5 Warranty

4.5.1 The Contractor warrants to the Owner and the Architect that all materials and equipment furnished under this Contract will be new unless otherwise specified, and all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not conforming to these requirements, including substitutions not properly approved and requirements including substitutions not properly approved and authorized, may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence. This warranty is not limited by the provisions of Paragraph 13.2.

4.6 Taxes

4.6.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor, which are legally enacted at the time bids, are received, whether or not yet effective.

Initial _____

4.7 Permits, Fees, and Notices

4.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and for all other permits and governmental fees, licenses and inspections necessary for the proper execution of the Contract.

4.7.2 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the performance of the Work.

4.7.3 If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Architect, he shall assume full responsibility therefore and shall bear all costs attributable thereto.

4.8 Allowances and Owner Furnished Equipment, Fixtures or Labor

4.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by these allowances shall be supplied for such amounts and by such persons as the Owner may direct, but the Contractor will not be required to employ persons against whom he makes a reasonable objection.

4.8.2 Unless otherwise provided in the Contract Documents:

- .1 these allowances shall cover the cost to the Contractor, less any applicable trade discount, of the materials and equipment required by the allowance delivered at the site, and applicable taxes;
- .2 the Contractor's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Sum and not in the allowance;
- .3 whenever the cost is more than or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order, the amount of which will recognize changes, if any, in handling costs on the site, labor, installation costs, overhead, profit and other expenses.

Initial _____

4.8.3 The Owner may directly furnish any or all of the

equipment, fixtures, or labor required for the Project. In the event the Owner elects to do so, the Contract Price for such equipment, fixtures, or labor will be reduced by the amount for equipment of labor being furnished by Owner. A Change Order reducing the Contract Price for that item of work shall be executed by Owner and Contractor to reflect a reduction in the Contract Price for that item, equipment, fixtures or work that the Owner is to furnish. The Contractor shall assume responsibility for and be fully responsible for the care, custody, and control of all Owner furnished equipment and/or fixtures once said equipment or fixtures arrive on the job site or in any approved off site storage facility.

4.9 Superintendent

4.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor and shall be confirmed in writing.

4.10 Documents and Samples at the Site

4.10.1 The Contractor shall maintain at the site for the Owner, one record copy of all Drawings, Specifications, Addenda, Change Orders, and other Modifications, in good order and marked currently to record all changes made during construction and approved Shop Drawings, Product Data and Samples. These shall be available to the Architect and shall be delivered to him for the Owner upon completion of the Work.

4.11 Shop Drawings, Product Data, and Samples

4.11.1 Shop Drawings are drawings, diagrams, schedules, and other data specifically prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

4.11.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

Initial _____

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

4.11.4 The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.

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

4.11.6 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architects approval of Shop Drawings, Product Data or Samples under Subparagraph 2.2.11, unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data, or Samples by the Architect approval thereof.

4.11.7 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, or Samples, to revisions other than those requested by the Architect on previous submittals.

4.11.8 No portion of the Work requiring submission of a Shop Drawing, Product Data, or Sample shall be commenced until the submittal has been approved by the Architect as provided in Subparagraph 2.2.11. All such portions of the Work shall be in accordance with approved submittals.

4.12 Use of Site

4.12.1 The Contractor shall confine operations at the site to areas permitted by law, ordinance, permits and the Contract Documents and shall not unreasonably encumber the site with any materials or equipment.

4.13 Cutting and Patching of Work

4.13.1 The Contractor shall be responsible for all cutting,

Initial _____

fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

4.13.2 The Contractor shall not damage or endanger any portion

of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner. The Contractor shall not unreasonably withhold from the Owner his consent to cutting or otherwise altering the Work.

4.14 Cleaning Up

4.14.1 The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work, he shall remove all his waste materials and rubbish from and about the project as well as all his tools, construction equipment, machinery and surplus materials.

4.14.2 If the Contractor fails to clean up at the completion of the Work, the Owner may do so as provided in Paragraph 3.4 and the cost thereof will be charged to the Contractor.

4.15 Royalties, Patents, and Records

4.15.1 The Contractor shall pay all royalties and license fees. He shall defend all suits and claims for infringement of any patent rights and shall save Owner and Architect harmless from loss on account thereof.

4.15.2 The Contractor shall not discriminate against any subcontractor, employee, or applicant for employment on the grounds of race, color, national origin, or sex.

4.15.3 The Contractor and all subcontractors under the general contract shall maintain copies of every sub-payroll period for the life of the construction contract and for a period of three (3) years after final release and payment is made by the Owner to the Contractor.

4.15.4 Each Contractor request for payment, including final payment and each partial payment, if permitted by the contract, shall contain a certification by the Contractor that performance by the Contractor and his subcontractor for the period of work covered by the payment request has been in accordance with the contract clauses and requirements with respect to nondiscrimination.

4.15.5 Representatives of Shelby County, as designated by the Mayor, shall have the right to inspect the Contractor's facilities and payroll records during the term of the construction contract and for a period of three (3) years after final release and final payment by the Owner for the purposes of verifying Initial _____

nondiscrimination in employment.

4.15.6 The Contractor shall incorporate the same requirements set forth in Subparagraph 5.3.1 in all Subcontracts awarded by him with the further requirement that each Subcontract include identical requirements to be included in any lower tier Subcontracts together with the requirement to include it in any further subcontracts that might be made.

4.16 Indemnification

4.16.1 (a) By executing this Agreement, the Contractor assumes the entire responsibility and liability for any and all claims, damage or injury of any kind or nature (including death) to all persons, whether employees of the Contractor or otherwise, and to all property (including but not limited to the replacement cost and loss of use of property), caused by, resulting from, arising out of, or occurring in connection with the performance of the Work by the Contractor, its agents, servants, employees, or subcontractors or anyone directly or indirectly employed by any of them for whose acts any of them may be liable.

(b) If any claim is made against the Owner for any damage, injury, death, or loss, whether such claim is based upon the Contractor or its agents, servants, employees, or subcontractors alleged active or passive negligence or participation in the wrong, or upon any alleged active or passive negligence or participation in the wrong, or upon any alleged breach of any statutory duty or obligation on the part of the Contractor, its agents, servants, employees or subcontractors, or in any other instance for which the Contractor has assumed responsibility in this Agreement, the Contractor shall indemnify, defend, and hold harmless the Owner, its officers, directors, agents, servants and employees from and against any and all loss, expense, judgment, damage or injury (including attorney's fees and expenses) that the Owner or its officers, directors, agents, servants or employees may sustain as the result of any such claim.

The Contractor shall assume on behalf of the Owner, its officers, directors, agents, servants and employees the defense of any action at law or in equity which may be brought against any of them upon any such claim, and shall pay on behalf of them the amount of any judgment with any costs or expenses incurred by any of them in connection with such claim.

Initial _____

4.16.2 Labor Indemnity

4.16.2.1 The Contractor shall indemnify, defend and hold harmless the Owner from any and all administrative and judicial actions

(including reasonable attorney's fees related to any such action) incurred by the Owner in connection with any labor related activity arising from the performance of the Work of the Contractor. As used in this Agreement, labor related activity includes, but is not limited to strikes, walkouts, informational or organizational picketing, use of placards, distribution of handouts, leaflets or in the vicinity of any facility where the Owner conducts business. The Owner shall advise the contractor if any labor related activity occurs and the Contractor shall arrange for the legal representation necessary to protect the Owner, provided such representation is previously approved by the Owner.

4.16.3 Attorney Fees

4.16.3.1 In the event it becomes necessary for Owner to employ an attorney to enforce any provision of this Agreement, then the Contractor shall be liable for all attorney's fees and litigation expense of Owner.

4.17 Progress Schedule

4.17.1 The Contractor shall, within five (5) days from receipt of the Notice to Proceed, prepare and submit for the Owner and Architect an estimated project schedule for the Work. The Progress Schedule shall be updated each month to reflect actual progress made and to forecast future progress of the Work. The Progress Schedule shall be related to the entire Project as provided by the contract Documents and shall provide for expeditious and practicable execution of the Work. The Owner reserves the right to reasonably reschedule the Work or the sequence of activities of the contractor for no additional compensation should it deem rescheduling to be in its best interest.

ARTICLE V **SUBCONTRACTORS**

5.1 Definition

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor is referred to throughout the Contract

Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative. The term Subcontractor does not include any separate contractor or his subcontractor.

Initial _____

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform any of the Work at the site. The term Sub-subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.

5.2 Award of Subcontracts and Other Contracts for Portions of the Work

5.2.1 Unless otherwise required by the Contract Documents or Bidding Documents, the Contractor, as soon as practicable after the award of the Contract, shall furnish to the Owner and the Architect in writing the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection. No work shall be commenced until approval of all such Subcontractors has been given in writing by the Owner. If required, the Contractor shall furnish evidence satisfactory to the Owner, showing each proposed Subcontractor is competent to execute the Work covered by the Subcontract.

5.2.2 The Contractor shall not contract with any such proposed person or entity to whom the Owner or the Architect has made reasonable objection under the provisions of Subparagraph 5.2.1. The Contractor shall not be required to contract with anyone to whom he has a reasonable objection.

5.2.3 If the Owner or the Architect has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner or the Architect has no reasonable objection. Such substitution shall in no way affect the Contract Sum.

5.2.4 The Contractor shall make no substitution for any Subcontractor, person, or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

5.2.5 The Contractor shall submit a status report with regard to Subcontractors identified on Exhibit C, which forms a part of

the Contract Documents, as to any change in the subcontractors identified thereon and the reasons for same, the dollars paid to the prior subcontractor and the amount of the new subcontract.

Initial _____

THIS REPORT SHALL BE SUBMITTED TO CONTRACTS ADMINISTRATION OF SHELBY COUNTY GOVERNMENT, 160 N. Main St., Suite 1109, Memphis, Tennessee, 38103.

5.3 Subcontractual Relations

5.3.1 By an appropriate agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and the Architect. Said agreement shall preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with his Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by the Paragraph 5.3, and identify to the Subcontractor any terms and conditions of the proposed subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to any Sub-subcontractors.

ARTICLE VI WORK BY OWNER OR BY SEPARATE CONTRACTORS

6.1 Owner Right to Perform Work and to Award Separate Contracts

6.1.1 The Owner reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract.

6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term

Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

Initial _____

6.2 Mutual Responsibility

6.2.1 The Contractor shall afford the Owner and separate contractor's reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall connect and coordinate his Work with theirs as required by the Contract Documents.

6.2.2 If any part of the Contractor's Work depends on proper execution or results in the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Architect any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acceptance of the Owner's or separate contractor's work as fit and proper to receive his Work.

6.2.3 Should the Contractor wrongfully cause damage to the work or property of the Owner or to other work on the site, the Contractor shall promptly remedy such damage as provided in Subparagraph 10.2.5.

6.2.4 Should the Contractor wrongfully cause damage to the work or property of any separate contractor, the Contractor shall upon due notice promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor who shall defend such proceedings, and if any judgment or award against Owner arises there from, the Contractor shall pay or satisfy it and shall reimburse the Owner for all Attorney's fees and Court costs which the Owner has incurred.

6.3 Owner Right to Clean Up

6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Paragraph 4.14, the Owner may clean up and charge the cost thereof to the contractors responsible therefore as the Owner shall determine to be just.

ARTICLE VII **MISCELLANEOUS PROVISIONS**

7.1 GENERAL COMPLIANCE WITH LAWS

7.1.1 If required, the Contractor certifies that it is

Initial _____

qualified or will take steps necessary to qualify to do business in the State of Tennessee and that it will take such action as, from time to time, may be necessary to remain so qualified and it shall obtain, at its expense all licenses, permits, insurance, and governmental approvals, if any, necessary to the performance of its obligations under this Agreement.

7.1.2 The Contractor is assumed to be familiar with and agrees that at all times it will observe and comply with all federal, state, and local laws, ordinances, and regulations in any manner affecting the conduct of the work. The preceding shall include, but is not limited to, compliance with all Equal Employment Opportunity laws, the Fair Labor Standards Act, Occupational Safety, and Health Administration (OSHA) requirements, and the Americans with Disabilities Act (ADA).

7.1.3 This Contract will be interpreted in accordance with the laws of the State of Tennessee. By execution of this contract the Contractor agrees that all actions, whether sounding in contract or in tort, relating to the validity, construction, interpretation and enforcement of this contract will be instituted and litigated in the courts of the State of Tennessee, located in Shelby County, Tennessee, and in no other. In accordance herewith, the parties to this contract submit to the jurisdiction of the courts of the State of Tennessee located in Shelby County, Tennessee.

7.2 Successors and Assigns

7.2.1 This Agreement (including without limitation, all obligations imposed by the Contract Documents) shall be binding upon and shall inure to the benefit of the parties= successors, assigns, and legal representative. The Contract shall not be assigned or sublet in whole or in part by the Contractor without the written consent of the Owner, nor shall the Contractor assign any monies due or to become due to him hereunder, without the previous written consent of the Owner.

7.3 Written Notice

7.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm, entity or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known to him who gives the

notice.

Initial _____

7.4 Claims for Damages

7.4.1 Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the other party, or of any of his employees, agents or others for whose acts he is legally liable, claim shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage.

7.5 Performance Bond and Labor and Material Payment Bond

7.5.1 The Contractor shall furnish and keep in force throughout the performance of the Work a separate performance bond and separate labor and material payment bond, each in the amount of the total of the Contract (as the same may be modified from time to time) conditioned upon the faithful performance of the Work by the Contractor and payment of all obligations arising in connection with the Work by the Contractor. Said bonds shall also guarantee to the Owner that the Work shall be free of all liens upon the property of the Owner. The bonds shall name the Owner as obligee and shall be with such Surety authorized to do business in the State of Tennessee and in such form and manner as approved by Owner. Said Bond shall be subject to final approval of the Shelby County Risk Management Department. Said bonds shall be furnished to the Owner prior to the commencement of the Work, or upon written request by Owner to Contractor after the Work has commenced.

7.6 Rights and Remedies

7.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available there under shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

7.6.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach there under, except as may be specifically agreed in writing.

7.7 Tests

7.7.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction

require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Architect timely notice of its readiness so the Architect may observe such inspection, testing

Initial _____

or approval. The Contractor shall bear all costs of such inspections, tests, or approvals conducted by public authorities. Unless otherwise provided, the Owner shall bear all costs of other inspections or tests.

7.7.2 If the Architect determines that any Work requires special inspection, testing, or approval, which Subparagraph 7.7.1 does not include, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing, or approval, and the Contractor shall give notice as provided in Subparagraph 7.7.1. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Architect's additional services and/or correction of the defective Work made necessary by such a failure; otherwise, the Owner shall bear such costs, and an appropriate Change Order shall be issued.

7.7.3 Required certificates of inspection, testing, or approval shall be secured by the Contractor and promptly delivered by him to the Architect.

7.7.4 If the Architect is to observe the inspection, tests or approvals required by the Contract Documents, he will do so promptly where practicable, at the source of supply.

ARTICLE VIII

TIME

8.1 **Definitions**

8.1.1 Unless otherwise provided, the Contract time is the period of time allotted in the Contract Documents for Substantial Completion of the Work as defined in Subparagraph 8.1.3, including authorized adjustments thereto.

8.1.2 The date of commencement of the Work is the date established in a notice to proceed. If there is no notice to proceed, it shall be the date of the Owner-Contractor Agreement or such other date as may be established therein.

8.1.3 The date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Architect when construction is sufficiently complete, in accordance with the

contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended.

Initial _____

8.1.4 The term day as used in the Contract Documents shall mean calendar day unless otherwise specifically designated.

8.2 Progress and Completion

8.2.1 All time limits stated in the Contract Documents are of the essence of the Contract.

8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Subparagraph 8.1.2. He shall carry the work forward expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

8.3 Delays and Extensions of Time

8.3.1 The Contractor shall proceed with each and every part of this Agreement in a prompt and diligent manner. The Contractor, without additional compensation, shall perform the Work at such times, in such order and in such manner as the Owner may direct. The Contractor shall commence, continue, and complete its performance of the Project so as not to delay Owner or other separate contractors of the Owner or subcontractors= completion of the Work or any portions thereof, and so as to insure completion as directed by Owner. Any time specified for the completion of the Work, or portion thereof, is a material provision of this Agreement, and time is of the essence. The Contractor shall furnish sufficient forces to assure proper performance of its Work in strict compliance with all performance or progress schedules for the Project.

8.3.2 The Contractor shall, from time to time, on written demand of Owner, give adequate evidence to Owner to substantiate the planned performance and progress of the Work and the various parts thereof. The Contractor shall promptly increase its work force, accelerate its performance, work overtime, work Saturdays, Sundays and holidays, all without additional compensation, if in the opinion of the Owner, such work is necessary to maintain proper progress. The Contractor will fully cooperate and coordinate its work with any other separate contractors of Owner or subcontractors at the Project. The Contractor shall bear the costs of all damages done to other separate contractors of Owner or subcontractors and shall be responsible for any damages caused by or resulting from acts or omissions of the Contractor in failing to make proper progress. The liability of the Contractor shall not be deemed waived by any assent or acquiescence by Owner to the Contractor's late performance. Owner shall be entitled to terminate this

Agreement due to late or threatened late performance, upon seven (7) days notice to proceed and Contractors failure to do so.

Initial _____

8.3.3 In the event any subcontractor should damage the Contractor, the Contractor shall neither seek nor be entitled to any compensation from Owner, but will seek its damages directly from such subcontractor. Should the Contractor's performance, in whole or part, be disrupted, interfered with or delayed, or be suspended in the commencement, prosecution or completion, for reasons beyond the Contractor's control and without its fault or negligence, the Contractor shall be entitled to an extension of time in which to complete its Work; but only if it shall have notified the Owner, in writing, of the cause of delay within five (5) days of the occurrence of the event. The Contractor and Owner agree that the Contractor shall not be entitled to any money damages regardless of fault as a result of any delay, acceleration, disruption, interference, suspension, or other event affecting the Contractor or the Contractor's performance.

ARTICLE IX PAYMENTS AND COMPLETION

9.1 Contract Sum

9.1.1 The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

9.2 Schedule of Values

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to the various portions of the Work, prepared in such form, and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used only as a basis for the Contractor's Applications for Payment.

9.3 Applications for Payment

9.3.1 At least ten days before the date of each progress payment established in the Owner-Contractor Agreement, the Contractor shall submit to the Architect an itemized Application for Payment, notarized if required, supported by such data substantiating the Contractor's right to payment as the Owner or the Architect may require, and reflecting retain age, if any, as

provided elsewhere in the Contract Documents. The Contractor shall indicate on each Application for Payment the dollar amount and percentage due Subcontractors.

Initial _____

Progress payments (monthly) will be made based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect as follows:

On or before the 10th day of each month, 95% of the proportion of the Contract Sum properly allocable to labor, materials and equipment incorporated in the Work, up to the first day of that month, less the aggregate of previous payments in each case. Payments will be less such retainage as the Architect shall determine for all incomplete work and unsettled claims.

9.3.1.1 Until final payment, the Owner will pay 95% of the amount due the Contractor on account of progress payments. If the manner of completion of the Work and its progress are and remain satisfactory to the Owner, it may, in its sole discretion, for each Work category shown to be 50% or more complete in the Application for Payment, without reduction of previous retainage, on presentation by the Contractor with Consent of Surety for each application, certify any remaining progress payments for each Work category to be paid in full.

9.3.1.2 The full Contract retainage may be reinstated at any time in the sole discretion of the Owner.

9.3.2 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site and, if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site.

9.3.3 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in the Article IX as **Aliens**; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other persons

performing Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

9.3.4 The Contractor shall submit a report with each Application for Payment, which sets forth all subcontractors performing work during that reporting period, the dollar amount paid to the subcontractor, etc. on the form provided by Shelby County Government. Initial _____

9.4 Certificate for Payment

9.4.1 The Architect will, within seven (7) days after the receipt of the Contractor's Application for Payment, issue a Certificate for Payment to the Owner for such amount as the Architect determines is properly due.

9.4.2 The issuance of a Certificate of Payment will constitute a representation by the Architect to the Owner, based on his observations at the site as provided in Subparagraph 2.2.3 and the data comprising the Application for Payment, that the Work has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and any specific qualifications stated in his Certificate); and that the Contractor is entitled to payment in the amount certified.

9.5 Progress Payments

9.5.1 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to his Sub-subcontractors in similar manner.

9.6 Payments Withheld

9.6.1 The Architect may decline to certify payments and may withhold his Certificate in whole or in part, to the extent necessary to protect the Owner, if in his opinion he is unable to make representations to the Owner as provided in Subparagraph 9.4.2. The Architect may also decline to certify payment or,

Initial _____

because of subsequently discovered evidence or subsequent observations, he may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in his opinion to protect the Owner from loss because of:

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials, or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or another contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time; or
- .7 persistent failures to carry out the Work in accordance with the Contract Documents.

9.6.2 When the above grounds in Subparagraph 9.6.1 are removed, payment shall be made, without interest, for any amounts previously withheld.

9.7 Substantial Completion

9.7.1 When the Contractor considers that the Work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Subparagraph 8.1.3, the Contractor shall prepare for submission to the Architect a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Architect on the basis of an inspection determines that the Work or designated portion thereof is substantially complete, he will then prepare a Certificate of Substantial Completion which shall establish the Date of

Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall

Initial _____
commence on the Date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

9.7.2 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof, as provided in the Contract Documents. Payment by the Owner upon application by the Contractor and certification by the Architect for Substantial Completion does not waive any claims the Owner may have against the Contractor.

9.8 Final Completion and Final Payment

9.8.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when he finds the Work acceptable under the Contract Documents and the Contract fully performed, he will promptly issue a final Certificate for Payment stating that to the best of his knowledge, information and belief, and on the basis of his observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract documents and that the entire balance found to be due the Contractor, and noted in said final Certificate, is due and payable. The Architect's final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Subparagraph 9.7.2 have been fulfilled.

9.8.2 Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied, (2) consent of surety to final payment and (3) if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of claims, encumbrances and/or alleged liens arising out of the Contract, to the extent and in such form as may be designated by the Owner. If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to

indemnify him against such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorney's fees.

Initial _____

9.8.3 The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.

ARTICLE X
PROTECTION OF PERSONS AND PROPERTY

10.1 Safety Precautions and Programs

10.1.1 The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.

10.2 Safety of Persons and Property

10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury, or loss to:

- .1 all employees on the Work and all other persons who may be affected thereby;
- .2 all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury, or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable

safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities. Pavements, sidewalks, alleys, adjacent buildings not included in this Contract, which may be damaged, shall be repaired and/or replaced immediately and in a manner satisfactory to the Architect, Shelby County and/or other governing officials.

Initial _____

10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy all damage or loss (other than damage or loss insured under Paragraph 11.3) to any property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, Subcontractor, or any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts the Contractor may be liable or responsible. The foregoing obligations of the Contractor are in addition to his obligations under Paragraph 4.16.

10.2.6 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Architect.

10.2.7 The Contractor shall not load or permit any part of the Work to be loaded to endanger its safety.

10.3 Emergencies

10.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury, or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article XII for Changes in the Work.

10.3.2 Whenever the Contractor has not taken sufficient precautions for the safety of the public or the protection of work to be performed under this Project, or adjacent structures or property which may be injured by processes of construction, demolition and/or site clearance on account of such neglect, and whenever an emergency shall arise and immediate action shall be considered necessary in order to protect public or private, persons or property interest, then the Architect and/or the Owner shall so instruct the Contractor.

10.3.3 If correction is not made in due time or if conditions such as lack of time prevent instructions to Contractor, then the Owner, without notice to the Contractor, may provide reasonable, suitable protection by causing such Work to be done and material to be furnished and placed as the Architect and Owner may consider necessary and adequate. The cost and expense of such work and

Initial _____

material so furnished shall be borne by the Contractor and, if the same shall not be paid on presentation of the bills thereof, such costs shall be deducted from any amounts due or to become due the Contractor. The performance of such emergency work under the direction of the Owner and/or Architect shall in no way relieve the Contractor of the responsibility for damages, which may occur during or after such performance.

10.3.4 None of the foregoing shall make the Owner and/or Architect responsible for foreseeing and protecting against emergency.

ARTICLE XI INSURANCE

11.1 Contractor Liability Insurance

11.1.1 The Contractor shall purchase and maintain, in a company or companies licensed to do business in the State of Tennessee, such insurance as will protect the Owner from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts the Contractor or Subcontractor may be liable:

- .1 claims under workers compensation, disability benefits, and other similar employee benefit acts;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;
- .4 claims for damages insured by personal injury liability coverage, which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;

.5 claims for damages, other than the Work itself, because of injury to or destruction of tangible property, including loss of use resulting there from; and

Initial _____

.6 claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability specified in the Contract Documents, section III, paragraph 31, or required by law, whichever is greater.

11.1.3 The insurance required by Subparagraph 11.1.1 shall include contractual liability insurance applicable to the Contractors obligations under Paragraph 4.16.

11.1.4 All insurance policies maintained by the Contractor shall provide that insurance as applying to the Owner shall be primary and non-contributing irrespective of such insurance as the Owner may maintain in its own name and on its own behalf.

11.1.5 Certificates of Insurance acceptable to the Owner shall be filed with the Owner at the time of submittal of the Contract Documents to the Owner for execution. These certificates shall contain a provision that coverage's afforded under the policies will not be canceled until at least thirty(30) days prior written notice has been given to the Owner. The Contractor shall immediately notify Shelby County Government, Contract Administration, 160 N. Main Street, Suite 550, Memphis, Tennessee 38103 of cancellation or changes in any of the insurance coverage required. Upon request of the Owner, certified copies of any of the required insurance policies may be requested from the Contractor or Contractor's insurance company, agency, or broker.

11.2 Owners Liability Insurance

11.2.1 The Owner shall at its discretion, purchase liability insurance or maintain a self-insured liability program.

11.3 Property Insurance

11.3.1 The General Contractor shall be responsible for all risk insurance for physical loss or damage for the project during construction until the project is accepted by the Owner at which time the Owner will provide the property coverage.

11.3.2 The Contractor shall pay each Subcontractor a just share of any insurance monies received by the Contractor, and by appropriate agreement, written where legally required for validity, shall require such Subcontractor to make payments to his Sub-subcontractors in similar manner.

11.3.3 The Contractor or his insurance agent, broker or insurance company shall furnish to Owner a copy of all policies with the Contactor within five days of request.

11.3.4 If the Owner requests in writing that insurance for risks other than those described in Subparagraphs 11.3 and 11.3.2 or 11.3.3 or other special hazards to be included in the property insurance policy, the Contractor shall, if possible, include such insurance, and the cost thereof shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order. Initial_____

ARTICLE XII CHANGES IN THE WORK

12.1 Change Orders

12.1.1 A Change Order is a written order to the Contractor signed by the Owner issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or the Contract Time. The Contractor by execution of the Change Order waives any further claims or damages in any manner whatsoever for the changes set forth in the Change Order.

12.1.2 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract

Documents.

12.1.3 The cost or credit to the Owner resulting from a change in the Work shall be determined in one or more of the following ways:

Initial _____

- .1 by lump sum properly itemized on the form furnished by the Owner which shall show the actual verified cost of the work, plus ten percent overhead and five percent profit; if the work is performed by a Subcontractor, the General Contractor is allowed an additional five percent;
- .2 by unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 by cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 by the method provided in Subparagraph 11.1.4.

12.1.4 If none of the methods set forth in Clauses 12.1.3.1, 12.1.3.2, or 12.1.3.3 is agreed upon, the Contractor, provided he receive a written order signed by the Owner, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Architect on the basis of the reasonable expenditures and savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, a reasonable allowance for overhead and profit, which shall be defined as ten percent overhead and five percent profit with an additional five percent going to the General Contractor when the work is performed by a Subcontractor. In such case, and also under Clauses 12.1.3.3 and 12.1.3.4 above, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: cost of labor, including social security, old age and unemployment insurance and fringe benefits required by agreement or custom; workers= or workmen compensation insurance; bond premiums, rental value of equipment and machinery; and the additional costs of supervision and field office personnel directly attributable to the change. Pending final determination of cost to the Owner, payments on account shall be made on the Architect's Certificate for Payment. The amount of credit to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in the Contract Sum will be the amount of the actual net

cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

Initial _____

12.2 Concealed Conditions

12.2.1 Should concealed conditions encountered in the performance of the Work below the surface of the ground or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or should concealed or unknown conditions in an existing structure of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, Contractor, subject to approval by the Architect, shall be entitled to a time extension for only the period that the Contractor's performance is extended due to the unforeseen conditions.

12.3 Minor Changes in the Work

12.3.1 The Architect will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such Changes shall be effected by written order, and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE XIII **UNCOVERING AND CORRECTION OF WORK**

13.1 Uncovering of Work

13.1.1 If any portion of the Work should be covered contrary to the request of the Architect or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for his observation and shall be replaced at the Contractor's expense.

13.1.2 If any other portion of the Work has been covered which the Architect has not specifically requested to observe prior to being covered, the Architect may request to see such Work, and it shall be uncovered by the Contractor. If such Work is found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the

Owner. If such Work is found not in accordance with the Contract Documents, the Contractor shall pay such costs. If the Work to be uncovered by the Contractor should have been inspected by the Architect prior to being covered, and the Work is found to be in accordance with the Contract Documents, the cost of the uncovering and recovering of the Work shall be borne by the Architect.

Initial _____

13.2 Correction of Work

13.2.1 The Contractor shall promptly correct all Work rejected by the Architect as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Architect's additional services made necessary thereby.

13.2.2 If, within one year after the Date of Substantial Completion of the Work or designated portion thereof, within one year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the term of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so. This obligation shall survive termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

13.2.3 The Contractor shall remove from the site all portions of the Work, which are defective or non-conforming, unless removal is waived by the Owner.

13.2.4 If the Contractor fails to correct defective or non-conforming Work as provided in Subparagraphs 4.5.1, 13.2.1, and 13.2.2, the Owner may correct it in accordance with Paragraph 3.4.

13.2.5 If the Contractor does not proceed with the correction of such defective or non-conforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten days thereafter, the Owner may, upon ten additional days' written notice, sell such Work at auction or a private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Architect's additional services made necessary thereby. If such proceeds of sale do not cover all costs, which the Contractor should have borne, the

difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

13.2.6 The Contractor shall bear the cost of making good all work of the Owner or separate contractors destroyed or damaged by such correction or removal.

Initial _____

13.2.7 Nothing contained in Paragraph 13.2 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Paragraph 4.5 hereof. The establishment of the time period of one year after the Date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations other than specifically to correct the Work.

13.3 Acceptance of Defective or Non-Conforming Work

13.3.1 If the Owner prefers to accept defective or non-conforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effective whether or not final payment has been made.

ARTICLE XIV TERMINATION OF THE CONTRACT

14.1 Termination for Default

14.1.1 Should the Contractor fail to perform in strict accordance with this Agreement, where or as Owner may so direct, or should the Contractor become insolvent, unable to or fail to pay its obligations as they mature or, in any other respect fail in the opinion of the Owner, to properly prosecute and perform any part of its work, fail to exert its best performance efforts, be involved in labor disputes, or be terminated under any other contract with Owner, then the Contractor may be deemed by Owner to have materially breached and to have defaulted in its obligations under this Agreement. In case of a breach and default, the Owner, at its discretion, may terminate this Agreement, or any part thereof, by giving five (5) days written notice thereof to the Contractor. In case of such termination, Owner may use any and all materials,

equipment, tools or chattels furnished by or belonging to the Contractor either at or for the Project.

14.1.2 The Contractor, on termination, will be deemed to have offered to Owner an assignment of all of its subcontracts and purchase orders relating to this Project. Owner may, at its discretion, do whatever is necessary to assure performance of any

Initial _____

terminated work and to take such action, if necessary, in the Contractor's name. Owner may withhold from Contractor any monies due or to become due under this or any other contract between the Contractor and Owner, to offset the damages incurred or possibly incurred as a result of the breach and default by the Contractor. In case of a breach, or in the event Owner is required to retain the services of an attorney to enforce any provisions of this Agreement, then the Contractor and its surety company shall be liable to Owner for any and all additional costs, expenses, attorney's fees and other damages, both liquidated and unliquidated, which directly or indirectly result from the Contractor's breach, threatened breach, default or lack of performance of any term or condition of this Agreement.

14.1.3 If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Architect's additional services made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or to the Owner, as the case may be, shall be certified by the Architect, upon application, in the manner provided in Paragraph 9.4, and this obligation for payment shall survive the termination of this Contract.

14.2 Termination for Convenience

14.2.1 Owner, by written notice, shall have the right to terminate and cancel this Agreement, without the Contractor being at fault, for any cause or for its own convenience, and require the Contractor to immediately stop work. In such event, Owner shall pay the Contractor for that Work actually performed and materials furnished in an amount proportionate to the Contract price. Owner shall not be liable to the Contractor for any other costs, including prospective profits on Work not performed.

ARTICLE XV RIGHT TO OCCUPY BY OWNER

15.1 Early Occupancy by Owner

15.1.1 The Owner has the right to occupy or use ahead of schedule all or any substantially completed or partially completed portion of the Work when such occupancy and use are in its best interest, notwithstanding the time of completion for all of the Work. If occupancy or use increases the cost of the Work (other than for corrections which are the responsibility of the Contractor) and/or as a result of the Owner exercising its rights

Initial _____

herein, the contractor shall be entitled to extra costs and extensions of time, or both. Claims for such extra costs and extensions of time, to be valid, shall be made in writing to the Owner within seven (7) calendar days of the notification of Owner to the Contractor of its intent to so occupy or use.

15.2 Corrections after Occupancy

15.2.1 After the Owner has taken occupancy of all or any substantially completed portion of the Work, the Contractor shall not disrupt the use and occupancy of the Owner to make corrections in the Work but shall, at the discretion of the Owner, make such corrections at the expense of the Contractor after normal working hours.

15.3 Heating, Ventilating, and Air-Conditioning Systems

15.3.1 The Owner may require the use and operation of any completed heating, ventilating, and air-conditioning equipment at the time it occupies or uses any substantially completed portion of the Work. In such event, the Owner may require the Contractor to operate such equipment and will pay the Contractor the cost of such utilities required for the use and occupancy of the Owner, but the Contractor shall be responsible for such equipment and for its careful and proper operation. At any time, the Owner may assume the care and maintenance of any portion of the Work, which it is occupying and using for the operation of any such equipment, but in each case, the Contractor shall not be relieved of its responsibility for the full completion of the Work and the protection of its tools, materials, and equipment.

**ARTICLE XVI
REGULATIONS**

16.1 Nondiscrimination in Employment

16.1.1 During the performance of this Contractual Agreement, the contracting party agrees as follows: The CONTRACTOR agrees that no person on the grounds of handicap, age, race, color, religion, sex, or national origin, shall be excluded from participation in, or be

denied benefits of, or be otherwise subject to discrimination in the performance of this contract, or in the employment practices of the CONTRACTOR. The CONTRACTOR shall upon request show proof of such non-discrimination, and shall post in conspicuous places available to all employees and applicants notices of non-discrimination.

16.2 [RESERVED]

Initial _____

16.3 Maintenance and Records

16.3.1 The Contractor and all Subcontractors under the General Contract shall maintain copies of every subcontract awarded and their own payrolls, for each weekly payroll period during the term of the Construction Contract and for a period of one (1) year after release and payment is made by Owner to the Contractor.

16.4 Owner's Right of Inspection

16.4.1 Representative of the Owner, as designated by the County Mayor, shall have the right to inspect the Contractor's facilities and payroll records during the life of the Construction Contract for a period of one (1) year after final release and final payment by the Owner for the purpose of verifying nondiscrimination in employment.

ARTICLE XVII

**PROCEDURE FOR INSTALLATION OR
REMOVAL OF FIBERGLASS INSULATION**

The following procedures should be adhered to when disturbing, installing, or removing fiberglass insulation. These procedures are established to minimize employee exposure to the adverse health affects of fiberglass exposure.

The below procedures are the minimal requirements for handling fiberglass in Shelby County Facilities. Mandates by code or law must be adhered to.

17.1 Installation, Removal, or Disturbance of Fiberglass Insulation

17.1.1 Install in well-ventilated areas and avoid breathing dust.

17.1.2 Wear loose, comfortable clothing and long-sleeved shirts to minimize skin contact.

17.1.3 Handle carefully to minimize airborne dust.

17.1.4 If high dust levels are anticipated during installation, such as with power tools, use appropriate NIOSH approved dust respirator.

17.1.5 All power cutting tools must be equipped with dust collectors.

Initial _____

17.2 Exposure

17.2.1 After use, wash with warm water and mild soap. Do not scratch or rub skin if it becomes irritated. Utilize running water.

17.2.2 Wash work clothes separately, and then rinses the washer.

17.2.3 Eye exposure: Flush with flowing water for at least 15 minutes. If symptoms persist, seek immediate medical attention.

17.3 Work Site Environment

17.3.1 Insure area is free of obvious partials through proper cleanup procedures. Use of vacuum with proper filters, or wet cleanup is acceptable. (This includes office furniture, floors, and walls.)

17.3.2 Initially there may be a potential adverse impact on indoor air quality within the general work area during the installation process. Notify building manager or other appropriate person that it will be necessary to establish and maintain adequate ventilation of the work area, without causing the entry of contaminants to other parts of the building. Persons who are sensitive to odors and/or chemicals should be advised to avoid the work area during this process.

17.3.3 Exposure to employees should be kept to a minimum.

17.3.4 Disturbance of ceiling tiles where fiberglass insulation exists requires the same procedures as if installation or removal was taking place.

BY THE SIGNING OF THIS DOCUMENT AND INITIALING EACH PAGE HEREOF, THE CONTRACTOR CERTIFIES THAT HE HAS READ AND UNDERSTANDS ALL OF THE ABOVE AND AGREES TO ABIDE BY THESE GENERAL CONSTRUCTION CONDITIONS.

CONTRACTOR

BY: _____

TITLE: _____

DATE: _____

constcnd.doc

SECTION 01 21 43
TIME ALLOWANCES (Weather Delays)

PART 1 GENERAL

1.1 EXTENSIONS OF CONTRACT TIME

A. The basis for an extension of time in accordance with the Shelby County General Conditions of the Contract for Construction, an extension of time may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard for the Baseline for that month. Time extension(s) will be at the Owner's Discretion.

1.2 STANDARD BASELINE FOR AVERAGE CLIMATIC WEATHER

A. Time extensions may be granted for rain, wind, snow or other natural phenomena of normal intensity for the locality where the Work is performed. For the purpose of determining extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for the contract period involved with the average of the preceding five (5) year climatic range during the same time interval based on the National Oceanic and Atmospheric Administration National Service statistics for the locality where Work is performed and on daily weather logs kept on the job site by the Contractor reflecting the effect of the weather on progress of the Work. Request for extension of time shall be made in writing within twenty (20) days following cause of delay. In case of continuing cause for delay, only one (1) claim is necessary. Time extension(s) will be at the Owner's Discretion.

1.3 ADVERSE WEATHER AND WEATHER DELAY DAYS

A. Adverse Weather is defined as the occurrence of one or more of the following conditions which prevent exterior construction activity or access to the site within twenty-four (24) hours:

1. Precipitation (rain, ice, snow) in excess of one-tenth inch (0.10") liquid measure.
2. Temperatures which do not rise above 32°F by 10:00 a.m.
3. Temperatures which do not rise above that specified for the day's construction activity by 10:00 a.m., if any specified.
4. Sustained wind in excess of twenty-five (25) mph
5. Standing snow in excess of one inch (1 ").

B. Adverse Weather may include, if appropriate, "dry-out" or "mud" days when all the following conditions are met:

1. For rain days above the standard baseline.
2. Only if there is a hindrance to the site access or site work.
3. At a rate no greater than 1 make-up day for each day of consecutive days of rain beyond the standard baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the Architect

C. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled work day, including a weekend day or holiday if the contractor has scheduled construction activity that day.

1.4 DOCUMENTATION AND SUBMITTALS

- A. Submit daily jobsite logs showing which and to what extent construction activities have been affected by weather.
- B. Submit actual weather data to support claim for time extension, obtained from nearest NOAA Weather Station or other independently verified source approved by the Architect at the beginning of the project
- C. Use Standard Baseline data provided in this Section when documenting actual delays due to weather in excess of the average climatic range.
- D. Organize claim and documentation to facilitate evaluation on a basis of calendar month periods, and submit to the Architect for review in accordance with the Shelby County General Conditions of the Contract for Construction
- E. If an extension of time is appropriate, it shall be affected in accordance with the Owner's Approval and the provisions of the Shelby County General Conditions of the Contract for Construction.

END OF SECTION

SECTION 01 31 13
PROJECT COORDINATION

PART 1-GENERAL

1.1 SUMMARY

A. Includes coordination of the portion of the General Contractor's work with that of all subcontractors involved with any portion of the Project Scope of the Work, including all mechanical, electrical, and masonry work.

B. Related Sections

1. Section 01 11 13 - Summary of the Work
2. Section 01 31 19 – Project Meetings
3. Section 01 32 16 – Construction Progress Schedule
4. Section 01 33 23 – Submittals
5. Section 01 77 19 – Closeout Requirements

1.2 CONTRACTOR'S DUTIES

A. Work with trades associated with the Scope of the Work.

B. Coordinate the schedules of all trades, including mechanical and electrical and masonry subcontractors.

1. Verify timely deliveries of products for installation by all trades.
2. Verify that labor and materials are adequate to maintain schedules.

C. Conduct conferences among all subcontractors and other concerned parties, as necessary to:

1. Maintain coordination and schedules.
2. Resolve matters in dispute.

D. Participate in project meetings:

1. Report progress of each trade.
2. Recommend needed changes in schedules.
3. Transmit minutes of meetings to trades as appropriate.

E. Temporary Utilities:

1. Coordinate installation, operation and maintenance, to verify compliance with project requirements and with Contract Documents.
2. Verify adequacy of service at required locations.

F. Shop Drawings, Product Data and Samples - Submittals:

1. Prior to submittal, review for compliance with Contract Documents.
 - a. Check field dimensions, clearance dimensions and finish requirements.
 - b. Check relation to available space.
 - c. Check anchor bolt settings and setting of other embedded items.
 - d. Review the effect of any changes on the work of other contracts or trades.
 - e. Check items to receive field finish. Verify that item is suitable to receive such finish.

f. Check compatibility with mechanical and electrical equipment and work of other trades.

G. Coordination Drawings:

1. Prepare, as required to assure coordination of work of, or affected by trades or to resolve conflicts.
2. Contractor to review prior to transmitting to appropriate trades.
3. Reproduce and distribute Contractor approved copies to all concerned parties.

H. Observe required testing; maintain a record of tests:

1. Testing agency and name of inspector.
2. Subcontractor.
3. Manufacturer's Representative present.
4. Date and time of testing.
5. Type of product or equipment.
6. Type of test and results.
7. Retesting required.

I. Verify that subcontractors maintain accurate record of documents.

J. Substitution and Changes:

1. Review proposals and request:
 - a. Check for compliance with Contract Documents.
 - b. Verify with work and equipment of other trades.
2. Recommend action to concerned parties.

K. Observe work of all trades, including mechanical and electrical work for compliance with requirements of Contract Documents.

1. Maintain list of observed deficiencies.
2. Promptly report deficiencies or discrepancies to applicable parties.

L. Assemble documentation for handling of claims or disputes involving various trades.

M. Equipment Startup:

1. Check to assure that utilities and specified connections are complete and that equipment is in operable condition.
2. Observe test, adjust and balance.
3. Record results, including time and date of startup.

N. Inspection and Acceptance of Equipment:

1. Prior to inspection, check that equipment is clean, repainted as required, testes and operational.
2. Assist inspector; prepare list of items to be completed or corrected.
3. Should acceptance and operation of equipment constitute the beginning of the specified guarantee period, prepare and transmit written notice to Owner.

O. Assemble Record Documents for subcontractors; transmit to Architect for delivery to Owner.

1.3 COORDINATION SCHEDULE

A. The schedule designates areas of basic responsibility of contractors and subcontractors, including items of mechanical work and electrical power and control wiring for the project, but does not define scope.

B. Refer to respective Sections of Project Manual for detailed descriptions of work required.

C. Contractor Shall:

1. Maintain Schedule throughout construction period; record changes in responsibilities due to:

a. Modifications to Contract.

b. Field orders.

c. Substitutions.

2. Reproduce and distribute revised schedule promptly after each change to affected subcontractors, material suppliers and Owner.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS

PART 1 GENERAL

1.1 SUMMARY

A. Work Included: To enable orderly review during progress of the Work, and to provide for systematic discussion of problems, the Architect will conduct project meetings throughout the construction period.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, Shelby County General Conditions and Sections in Division 1 of these Specifications.
2. The Contractor's relations with his subcontractors and materials suppliers and discussions relative thereto are the Contractor's responsibility and normally are not part of project meetings content.

1.2 SUBMITTALS

A. Agenda Items: To the maximum extent practicable, advise the Architect at least 24 hours in advance of project meetings regarding items to be included on the agenda.

B. Minutes: The Architect will compile minutes of each project meeting and will furnish copies to the General Contractor and to the Owner. Recipients of copies may make and distribute such other copies as they wish.

1.3 QUALITY ASSURANCE.

A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

PART 2 PRODUCTS

(Refer to Products within other Sections within this Project Specification.)

PART 3 EXECUTION

3.1 MEETING SCHEDULE:

A. Except as noted herein for Pre-construction Meeting, project meetings will be held bi-weekly. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION:

A. The Architect will establish meeting location. To the maximum extent practicable, meetings will be held at the job site.

3.3. PRE-CONSTRUCTION MEETING.

A. Pre-Construction Meeting will be scheduled by the Architect. Provide attendance by authorized representatives of the Contractor and major subcontractors. The Architect will advise other interested parties, including the Owner, and request their attendance.

B. Minimum Agenda: Data will be distributed and discussed on at least the following items.

1. Organizational arrangement of Contractor's forces and personnel, and those of subcontractors, materials suppliers, and the Architect.
2. Channels and procedures for communication.
3. Construction schedule, including sequence of critical work.

4. Contract Documents, including distribution of required copies of original documents and revisions.
5. Processing of Shop Drawings and other data submitted to the Architect for review.
6. Processing of Bulletins, field decisions, and Change Directives.
7. Rules and regulations governing performance of the Work.
8. Procedures for safety and first aid, security, quality control, housekeeping, and related matters.

3.4 PROJECT MEETINGS

A. Attendance

1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.
2. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

B. Minimum Agenda

1. Review, revise as necessary, and approve minutes of previous meetings.
2. Review progress of the Work since last meeting, including status of submittals for approval.
3. Identify problems that impede planned progress.
4. Develop corrective measures and procedures to regain planned schedule.
5. Complete other current business.

C. Revisions to Minutes

1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting; they will be accepted as properly, stating the activities and decisions of the meeting.
2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

END OF SECTION

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1. SUMMARY

A. The contractor shall provide a schedule to serve as a basis for a detailed construction sequence. The detailed construction schedule shall describe and document the construction sequence necessary to execute the scope of work.

1.2 DESCRIPTION

A. Utilize a computer generated schedule for the planning and scheduling of all work required under the Contract Documents. In addition to construction activities, detailed network activities shall include the submittal of shop drawings, catalog cut sheets, and materials samples, review and approval of these submittals, and fabrication and delivery of materials and equipment. Work by separate contractors and project close - out activities shall also be included to account for their effect on the overall sequencing of the project.

1.3. SCHEDULE STANDARDS

- A. The schedule shall demonstrate a logical succession of work from start to finish. Constrained start and finish dates shall be kept to a minimum, such that the schedule logic (activity relationships and durations) will determine the schedule start and finish of each activity.
- B. The durations indicated for each activity shall be in "work - days" and shall represent the required time for the activity considering the scope of work and resources planned for the activity including time for inclement weather and other predictable delays.
- C. Multiple calendars shall be utilized as required to allow for specific times of the week, month, or year when specific activities can or cannot be accomplished. Specific examples include, but are not necessarily limited to, Site Based activities which require limited noise and other site based activities which require considerations, such as building occupant morning and afternoon commuting arrival and departure times, consult with the Architect regarding additional time-frames which require Site Based activities to take priority over normal owner use of the site.

PART 2 PRODUCTS

1.1. Not Used

PART 3 EXECUTION

3.1. GENERAL

- A. Prepare a computer generated schedule of all construction related work required by this contract.
- B. Include the following information in the database for each activity:
1. Activity Description - should indicate type of work being performed and. general location or phase.
 2. Calendar - the standard calendar is a five day workweek.
 3. Duration - should indicate "work - days" required to accomplish the task.

4. Schedule Dates - Early Start, Early Finish, Late Start, and Late Finish for each activity will result from the calculation of the schedule.

3.2 SUBMITTAL PROCEDURE

A. Time of Submittals:

1. Within Five (5) working days after Notice to Proceed, the Contractor shall submit its project schedule for review. The schedule produced and submitted shall indicate interim milestone and completion dates. The Architect will review the schedule within ten working days and state acceptance or rejection of the schedule.
2. Within ten working days after the conclusion of the Architect's review, the Contractor shall revise the schedule as required and resubmit. This schedule shall constitute the project Work schedule unless a revised schedule is required due to substantial changes in work or contract time, delinquency by the Contractor requiring a recovery schedule, or as otherwise provided.
3. Acceptance of the project schedule will be required prior to the processing of any application for payment.
4. Submit a copy of the schedule, clearly showing progress made during the previous month along with each Application for Payment.

B. Acceptance of Schedule:

1. The schedule will be acceptable when it provides a description of an orderly progression of the work to completion in accordance with the contract requirements, adequately defines the Contractor's work plan, and provides a workable arrangement for the processing of submittals in accordance with the requirements.
2. Review and acceptance of the Contractor's project schedule is for conformance to the requirements of the contract documents only. It does not relieve the Contractor of any responsibility for the accuracy or feasibility of the project schedule, or of the Contractor's ability to meet the interim milestone dates and contract completion date.

C. Submittal Items:

1. Initial submittals shall include the following:
 - a. Critical Path Graphic Report - include all activities for the entire project. Sort by early start, early finish, and total float; organize by submittal activities, construction activities, etc. Include activity ID, description, original duration, early start, early finish, and total float. Individual pages shall not exceed 11 inches by 17 inches.
 - b. Back-up digital file
 - e. Reports shall be submitted in triplicate plus any copies to be returned to the Contractor.
2. Monthly submittals to be included with Application for Payment shall include the following:
 - a. Project Narrative. Report - shall include a brief description of work that was accomplished during the previous month as well as work to be pursued during the upcoming month.
 - b. Critical Path Graphic Report - shall be a three-month look ahead schedule to include previous month's progress plus work to accomplish during the two months following the data date. Schedule bars shall be compared to the initial schedule as a baseline. Include the same activity information as in initial bar chart graphic report.
 - c. Back-up digital file
 - d. Reports shall be submitted in triplicate plus any copies to be returned to the Contractor.

D. Schedule Revisions:

1. No changes may be made in the sequence, duration, or relationship of any activity without the acceptance of the Architect. Requests for minor changes to the schedule may be submitted in the form similar to the schedule form identified herein. More substantial revisions will require re-submittal of the entire schedule.

2. If at any time the Architect considers the milestone or completion dates to be in jeopardy because of work activities behind schedule, the Contractor shall provide a revised Critical Path Work Schedule, including resource requirements, to show how the Contractor intends to bring the project back on schedule. "Activities behind schedule" are any activities whose current schedule early dates are later than indicated in the initial schedule.
3. If a change directive has a schedule impact, that impact shall be submitted with the change directive request.

END OF SECTION

SECTION 01 33 23
SUBMITTALS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Proposed products list.
- C. Shop drawings.
- D. Product data.
- E. Samples.
- F. Manufacturers' instructions.
- G. Manufacturers' certificates.

1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Architect accepted form.
- B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and deliver to Architect at business address. Coordinate submission of related items.
- F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- G. Provide space for Contractor and Architect review stamps.
- H. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.3 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Owner-Contractor Agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.4 SHOP DRAWINGS

- A. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Architect.

1.5 PRODUCT DATA

- A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Architect.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

1.6 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect's selection.
- C. Include identification on each sample, with full Project information.
- D. Submit the number or samples specified in individual specification Sections; one of which will be retained by Architect.
- E. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.7 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, in quantities specified for Product Data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.8 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturer's certificate to Architect for review, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not used

END OF SECTION

SECTION 01 50 00
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. This Section describes construction facilities and temporary controls required for the Work.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Except that equipment furnished by subcontractors shall comply with requirements of pertinent safety regulations, such equipment normally furnished by the individual trades in execution of their own portions of the Work are not part of this Section.
3. Permanent installation and hookup of the various utility lines are described in other Sections and on the Contract Document Drawings where applicable.

1.2 REQUIREMENTS

A. Provide construction facilities and temporary controls needed for the Work including, but not necessarily limited to:

1. Temporary utilities such as water and electricity.
2. Sanitary facilities.
3. Enclosures such as tarpaulins, barricades, and canopies.
4. Emergency Preparedness supplies.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Maintain temporary facilities and controls in proper and safe condition throughout progress of the Work.

PART 2 - PRODUCTS

2.1 UTILITIES

A. Water: At no cost to the Contractor, the Owner will furnish all necessary water for testing, sterilizing, flushing, and other construction purposes, subject to the following conditions:

1. Water will be available from existing water facilities, at locations designated by the Owner. The Contractor shall make all necessary arrangements and shall provide all necessary hoses, temporary pipework, portable tanks, and other equipment to convey the water to the usage locations.
2. Carefully conserve all water, and do not waste it unnecessarily.
3. Before each water delivery from the existing water facilities, obtain the Owner's prior approval of the time and duration of flow, approximate rate of flow, and approximate volume of water required.

B. Electricity: Owner will provide.

1. Electricity will be available from existing electrical facilities, at location approved by the Owner. The Contractor shall make all necessary arrangements with local electrical utility company and shall provide all temporary wiring and temporary equipment required to convey the electricity to the usage locations.
2. Carefully conserve all electricity, and do not waste it unnecessarily.
3. Do not overload existing electrical facilities, and do not adversely affect the operation of any existing electrically operated equipment.
4. Remove all temporary electrical work promptly after it is no longer required.

2.2 SANITARY FACILITIES

- A. Provide temporary sanitary facilities in the quantity required for use by all personnel.
- B. Maintain in a sanitary condition at all times.

2.3 TEMPORARY CONSTRUCTION

- A. Provide and maintain for the duration of construction all scaffolds, tarpaulins, canopies, warning signs, steps, platforms, bridges, chutes, and other temporary construction necessary for proper completion of the Work in compliance with pertinent safety and other regulations.

2.4 REMOVING AND REPLACING FENCES, SOD, ETC.

- A. Where required to install the Work, carefully remove and store all interfering fences, mailboxes, culverts, etc. After installation of work and backfilling, reinstall these items and restore them to at least the conditions which existed prior to the commencement of work, using materials and workmanship to match those of the original construction and installation.
- B. Carefully remove and store all interfering shrubbery, trees, sod, flowers, and other planting, sufficiently in advance of construction. After installation of work and backfilling, reset and restore these items to at least the conditions that existed prior to the commencement of work.
- C. Upon completion of the Work, restore all lawns to at least the conditions that existed prior to the commencement of the work.
- D. Site infrastructure damaged during the course of the Work will be replaced or repaired to at least the conditions that existed prior to the commencement of the work. These items include, though are not limited to, driveway and parking lot surfaces, sidewalks, curbs, and gutters.

2.5 EQUIPMENT AND MATERIALS STORAGE AND PROTECTION

- A. Equipment and Materials Which Will Be Installed Indoors: At all times prior to its installation within permanent facility buildings and structures which are sufficiently enclosed to provide adequate weather protection, store this equipment in dry weathertight warehouses or other shelters which will completely protect this equipment from damage by weather and other causes. Obtain Architect's prior approval of proposed storage facilities; plastic wrapping or covering alone will not be considered adequate protection.
 1. This includes but shall not be limited to all architectural finish materials and products.
- B. Equipment and Materials Which Will be Installed Outdoors: At all times prior to its installation, store this equipment and these materials on pallets, skids, runners, platforms, or other suitable supports which will hold all parts of this equipment and these materials at least six inches above ground; provide watertight coverings for those stored items which may be damaged by rain or snow; all as approved.

C. Payment for Stored Materials and Equipment: No payment will be made for on-site or off-site stored materials and equipment which is not stored as specified above.

D. At Contractor's expense, provide temporary weathertight storage for materials which may be damaged by storage exposed to weather.

2.6 TRAFFIC CONTROL

A. Schedule and perform all work to interfere as little as possible with vehicular traffic flow. Poor planning and gross inconsideration of traffic flow will be just cause for the Owner to stop the Contractor's work until the unsatisfactory conditions have been remedied. Blocking of service driveways and fire lanes is prohibited.

B. Provide safety precautions and warnings in accordance with Shelby County General Conditions of the Contract for Construction.

C. Use only site entrances that have been approved by the Owner for temporary use as Construction Entrances.

2.7 EMERGENCY SUPPLIES

A. First Aid Kit

B. Not Used

C. Not Used

D. Tarps: Two (2) 20'x100' Plastic.

E. Water Pumps: Two (2) 30-gallon per minute capacity.

F. Not Used

G. Hoses: Two (2) 25'foot hoses.

PART 3 - EXECUTION

3.1 MAINTENANCE AND REMOVAL

A. Maintain temporary facilities, controls, and emergency supplies as long as needed for safe and proper completion of the Work.

B. Remove such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the Architect.

END OF SECTION

SECTION 01 66 00
DELIVERY, STORAGE AND HANDLING

1 GENERAL

1.1 SUMMARY

A. Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions and Sections in Division 1 of these Specifications.
2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS

A. Except as otherwise approved by the Architect, determine and comply with manufacturers' recommendations on product handling, storage, and protection.

1.4 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

1. Maintain packaged materials with seals unbroken and labels intact until time of use.
2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

B. The Architect may reject as non-complying such material and products that do not bear identification satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.

1.5 PROTECTION AND HANDLING

A. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

1.6 REPAIRS AND REPLACEMENTS

A. In event of damage to the Owner's property or to work in progress, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION

SECTION 01 74 23
CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this Section.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions and Sections in Division 1 of these Specifications.
2. In addition to standards described in this Section, comply with requirements for cleaning as described in pertinent other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

B. In addition to the standards described in this Section, comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

1.1 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

1.2 COMPATIBILITY

A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION

1.1 PROGRESS CLEANING

A. General:

1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
2. Do not allow accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire

protection and protection of the ecology.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Re-stack, tidy, or otherwise service arrangements to meet the requirements of subparagraph 3.1-A-1 above.
3. Maintain the site in a neat and orderly condition at all times.

1.2 FINAL CLEANING

A. "Clean," for the purpose of this section, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

B. Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in Article 3.1 above.

C. Site:

1. Unless otherwise specifically directed by the Architect, broom clean paved areas on the site and public paved areas adjacent to the site and completely remove resultant debris.
2. Remove all nails and other debris produced by the Work.

D. Not Used

E. Schedule final cleaning as approved by the Architect to enable the Owner to accept a completely clean Work.

1.3 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the Work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning shall be as determined by the Architect in accordance with the General Conditions.

END OF SECTION

SECTION 01 77 19
CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Closeout Procedures
- B. Final Cleaning
- C. Project Record Documents
- D. Operation and Maintenance Data
- E. Warranties and Bonds

1.2 RELATED WORK

- A. Agreement Between Owner and Contractor.
- B. Section 01 11 13 - Summary of the Work.
- C. Section 01 33 23 – Submittals.
- D. Shelby County General Conditions of the Contract for Construction

1.3 CLOSEOUT PROCEDURES

- A. Comply with procedures stated in SCG Requirements for issuance of Certificate of Substantial Completion.
- B. When Contractor considers that the Work has reached final completion, submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with contract Documents and ready for the Architect's inspection.
- C. In addition to submittals required by the conditions of the Contract, provide submittals required by governing authorities, and submit a final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Architect will issue final Change Directive reflecting approved adjustments to Contract Sum not previously made by Change Directive.
- E. Submit all close-out documents and products to the Architect.

1.4 FINAL CLEANING

- A. Complete prior to final inspection.
- B. Clean interior and exterior surfaces exposed to view; remove ALL temporary labels, stains and foreign substances, clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.
- C. Thoroughly clean all exterior and interior finishes.
- D. Identify, remove and dispose of all debris and hazardous waste from site. Dispose of materials in compliance with current local, state and federal environmental requirements.

1.5 OPERATION AND MAINTENANCE DATA

- A. Provide names and addresses of manufacturers and suppliers of equipment and materials and general and subcontractors.

B. Provide data for:

1. Installed Engineering Design Loads for Pre Engineered Steel Building
2. Any other items specifically identified in individual specification sections of this Project Manual.

C. Submit four (4) sets prior to final inspection, bound in 8-1/2" x 11" three-ring side binders with durable plastic covers, tabbed with permanent tab markers and identified on face and spine.

1. Part 1: Directory, listing names, addresses and telephone numbers of Architect/Engineer and Contractor(s).
2. Part 2: Operation and maintenance instructions arranged by system. For each system give names, addresses, and telephone numbers of subcontractors and suppliers.

Provide:

- a. Appropriate design criteria.
- b. List of Equipment
- c. Maintenance instructions, identifying required cleaning materials and solutions for removals of (i.e. graffiti, marker ink, efflorescence, Etc.)
- d. Maintenance instructions, to protect finishes.
- e. Shop drawings and product data.
- f. Warranties.

1.6 ADDITIONAL DOCUMENTATION

A. Provide the following documentation in addition to that previously specified:

1. Consent of Surety to Final Payment
2. Contractor's Affidavit of Release of Liens
3. Contractor's Affidavit of Payment of Debts and Claims.
4. Lien Waiver from all Subcontractors.
5. Non-asbestos/lead Certification.

1.7 WARRANTIES AND BONDS

A. Provide duplicate, notarized copies. Execute Contractor's submittals and assemble documents executed by subcontractors, suppliers, and manufacturers. Provide table of contents and assemble in binder with durable plastic cover.

B. Submit material prior to final application for payment. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing(s) of ALL Manufacturers Warranties, date(s) of acceptance as start and end of warranty period(s).

C. Manufacturers Warranties:

1. Reference ALL other related specification sections.

D. Contractor Warranties:

1. Provide all Contractor's and subcontractor's materials and workmanship warranties.

1.8 PRODUCTS

A. Provide ALL Products Data with ALL other related product information to the Architect to assist the Owner with the proper maintenance, repair, or replacement re-use of all Products utilized for this Project.

1.9 SPECIAL CERTIFICATION(S)

- A. Provide duplicate, notarized copies.
- B. Provide certification(s) that products and materials installed are free of asbestos and comply with current local, state and federal requirements regarding use of non-asbestos materials.
- C. Provide certification(s) that products and materials installed are free of lead and comply with current local, state and federal requirements regarding use of non-lead materials.
- D. Provide copies of all environmentally related permits required, and fee receipts for disposal of hazardous materials from the construction site (if applicable).

1.10 FINAL ACCEPTANCE AND PAYMENT

- A. Conform to Contract requirements for Final Completion and Final Payment, Division 0 of the Specifications.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Demolition and removal of designated pavement materials and parking lot accessories including portions of existing asphalt pavement, painted markings, and concrete wheel stops, pole mounted light fixtures and associated concrete mounting bases and protective steel pipe bollards, and abandoned or bypassed underground utilities. Demolition shall also include temporary disassembly of selected portions of fencing and gates. All demolition shall include the removal of those demolished materials from the site and their proper disposal with the exception of items that are to be retained and properly stored by the Contractor for reuse by the Owner.

1.2 RELATED SECTIONS

A. Division 2 – Sitework

B. Division 16 - Electrical

B. Documents affecting work of this Section also include, but are not necessarily limited to, the Shelby County General Conditions of the Contract for construction and other Sections in Division 1 of these Specifications. It is the Contractors' responsibility to familiarize themselves with these documents prior to submitting a bid for the Work.

1.3 QUALITY ASSURANCE

A. Contractor Qualifications: Minimum of five years experience in this type of demolition.

B. Meet the requirements of the local regulatory agencies.

C. Permit for transporting and disposal of debris.

1.4 JOB CONDITIONS

A. Protection:

1. Erect barriers, fences, guard rails, enclosures, chutes, dust barriers and shoring to protect personnel, property, structures, and utilities remaining intact.

2. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Except where noted otherwise, maintain possession of Owner material being demolished. Immediately remove these materials from site.

B. Carefully remove, store, and protect for re-installation or return to the Owner all materials and equipment that is noted on drawings to be relocated or re-used. Repair or replace using matching materials of equal quality, and at no cost to the Owner, all existing materials and construction not designated for removal that become damaged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Demolish designated materials in an orderly and careful manner. Examine the site and building elements shown to be removed and verify the demolition requirements with the Architect prior to beginning the work.
- B. Notify the Owner and the Architect prior to removal of any hazardous materials if any are encountered. After removal, notify the Owner that all hazardous materials have been removed and the work space conditions are certified safe by the Contractor's Hazardous Materials Abatement SubContractor.
- C. Prior to the commencement of any demolition work exterior surface drainage in the project scope of work area is to be inspected and tested for proper functioning. If required, the Owner is to be notified through the Architect of any areas which do not drain properly.

3.2 PREPARATION

- A. The facility will be occupied during construction. Schedule times for operation of excessively loud or prolonged use of noisy or dust producing equipment with the Owner. Erect and maintain protective safety barriers at all times between building occupants and construction zones.
- B. Erect temporary weatherproof closures for exterior building envelope openings.
- C. Erect and maintain dustproof partitions capable of preventing the spread of dust, fumes, and smoke to occupied portions of the building. Upon completion of the work, remove partitions and repair damaged surfaces to match adjacent existing surfaces.

3.3 DEMOLITION REQUIREMENTS

- A. Perform demolition in accordance with the requirements of applicable authorities having jurisdiction.
- B. Repair all demolition performed in excess of that required, at no cost to the Owner.
- C. Remove only non-structural elements. Do not cut or alter structural elements without specific authorization from the Architect.
- D. Perform all concrete, masonry, and asphalt cutting using power-driven saws to achieve straight, even surfaces. Power impact tools are prohibited from use.
- E. Burning of materials on site is not permitted.
- F. Remove from site contaminated, vermin infested or dangerous materials encountered and dispose of by safe means so as not to endanger health of workers and public.
- G. Carry out demolition work in a manner that will cause as little inconvenience as possible to adjacent occupied building areas and adjacent building construction.
- H. Remove demolished materials, tools, and equipment from site upon completion of work. Leave site in a condition acceptable to the Owner.
- I. Erect and maintain weatherproof closures for exterior openings. Mechanical equipment and other items to be removed shall be put back in place, replaced, or their openings shall be made watertight by the end of each workday.
- J. Not Used
- K. Disconnect and reconnect plumbing, mechanical, and electrical items as may be required by properly licensed workers to prevent disruption of the operation of the facility. Provide for uninterrupted temporary utility services or schedule disconnections for evenings and weekends to avoid disruption of operations within the building for standard work day schedule operations. Schedule all work in advance with the Owner.
- L. Prior to new construction, final completion of demolition work, all damaged conditions revealed after demolition materials are removed shall be repaired and made whole prior to installation of any new roofing

construction materials.

3.4 CUTTING AND DRILLING

- A. Perform cutting with hand tools or with small power-driven tools. Cut holes and slots neatly to size required with the minimum disturbance to adjacent work.
- B. Where required, cut round holes in concrete slabs and masonry walls with core drills of required sizes. Saw cut rectangular holes with power-driven tools.
- C. Cover openings temporarily when not in use and patch openings as soon as new work is in place.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Contract Document Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to work of this Section.
- B. Section 13 34 19 – Pre -Engineered Steel Buildings

1.2 DESCRIPTION OF WORK

A. Furnish all labor, materials, equipment, and incidentals necessary to complete all concrete as indicated on the Drawings and/or specified herein. Normal weight concrete and semi-lightweight concrete are covered by this specification, but are not necessarily required for this project.

1.3 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 31 22 00 - Earthwork

1.4 CODES AND STANDARDS

A. American Concrete Institute

1. ACI 301-Specifications for Structural Concrete Buildings
2. ACI 306-Recommended Practice for Cold Weather Concreting
3. ACI 318-Building Code Requirements for Reinforced Concrete
4. ACI 605-Recommended Practice for Hot Weather Concreting
5. ACI 614-Recommended Practice for Measuring, Mixing, and Placing Concrete

B. American Society of Testing Materials

1. ASTM C31-Standard Method of Making and Curing Concrete Compressive and Flexural Strength Test Specimens in the Field
2. ASTM C33 -Standard Specification for Concrete Aggregates
3. ASTM C39 -Standard Method of Test for Compressive Strength of Molded Concrete Cylinders
4. ASTM C94 -Standard Specification for Ready-Mixed Concrete
5. ASTM C143-Standard Method of Test for Slump of Portland Cement Concrete
6. ASTM C150-Standard Specifications for Portland Cement
7. ASTM C172-Standard Method of Sampling Fresh Concrete
8. ASTM C173-Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method
9. ASTM C230-Standard Specifications for Flow Table for Use in Tests of Hydraulic Cement
10. ASTM C260-Standard Specifications for Air-Entraining Admixtures for Concrete
11. ASTM C309-Specifications for Liquid Membrane-Forming Compounds for Curing Concrete
12. ASTM C494-Standard Specifications for Chemical Admixtures for Concrete

1.5 NOTICE

A. Notify Architect/Structural Engineer not less than 24 hours prior to placing concrete. Omitted and misplaced reinforcement and embedded items are Contractor's responsibility, and the Contractor is not relieved by the Architect/Structural Engineer's observation.

1.6 CONCRETE MIX DESIGN

A. Submit five copies of the concrete mix designs with supporting data confirming compliance with ACI 318 for Architect/Structural Engineer's review.

B. Normal weight concrete: Establish concrete mix design proportion per ACI 318. Mix designs not conforming to ACI 318 will be rejected. Indicate type and quantities of material used, the fresh unit weight, slump, air content, aggregate analysis, dry weight of aggregates, saturated weight of aggregates, admixtures, and compressive strengths. Verify information with results of a laboratory trial batch. An independent Testing Agency shall certify that the materials used meet all applicable ASTM Specifications. Payment for the design and verifying the concrete mix design will be paid for by the supplier.

1.7 SLUMP

A. Provide concrete with a slump of 4 inches (100 mm) plus or minus one inch (25 mm). Maximum slump after high range water reducers are added shall be eight inches (200 mm).

1.8 FRESH UNIT WEIGHT

B. Provide normal weight concrete with a fresh unit weight of 145 to 155 pcf.

1.9 AIR CONTENT

A. Provide air content of five percent plus or minus one and one half percent for normal weight concrete.

1.10 MATERIALS

A. Materials designated by specific manufacturer's trade names are approved, subject to compliance with the quality and performance indicated by the manufacturer. Instructions and specifications published by the manufacturer of such materials are included in and are a part of these specifications. Upon request provide a copy certificate from manufacture or supplier that materials designated by reference to ASTM and ACI standards meet the requirements of these agencies of latest edition.

1.11 TESTING

A. A Testing and Inspection Agency selected by the Architect/Structural Engineer will perform concrete tests. Payment for tests will be Contractor unless noted otherwise.

1.12 TESTING FOR NONCOMPLIANCE

A. Additional testing, inspection, or design due to noncompliance of materials or workmanship with the design drawings and specifications, or for the Contractor's convenience, will be paid for by the Contractor. The Owner

must be notified of deviations for the Contractor's convenience.

PART 2 - PRODUCTS

2.1 CONCRETE STRENGTH

A. Provide 4,000 psi concrete unless noted otherwise on the plans.

2.2 CEMENT

A. Provide Type I Portland Cement per ASTM C150, unless noted otherwise on the Structural Drawings. Use one brand only.

2.3 AGGREGATE

A. Provide fine aggregate of natural sand in accordance with ASTM C33. Provide coarse aggregate of gravel or crushed stone in accordance with ASTM C33 for normal weight concrete. Size coarse aggregate in accordance with ACI 318. Aggregate for exterior ramp and walls to be limestone & pea gravel to match existing walls.

2.4 REINFORCING STEEL

A. Size as indicated on Drawings and comply with ACI 318.

2.5 WATER

A. Provide clean, potable water free of deleterious substances per ACI 318.
B. No water shall be added at the jobsite without the approval from the Engineer of Record.

2.6 AIR ENTRAINING AGENT

A. Provide air entraining agent per ASTM C260 in all concrete.

2.7 FLY ASH

A. Use of Fly Ash in concrete is not permitted.

2.8 WATER REDUCER

A. Provide water reducing agent per ASTM C494.

2.9 CALCIUM

A. Use no calcium chloride in concrete.

2.10 CURING COMPOUND

A. Use no curing compounds in concrete.

PART 3 - EXECUTION

3.1 QUALITY CONTROL

A. The following are the responsibility of the testing laboratory:

B. Verify the concrete mix designs as specified herein.

C. Mold, handle, protect and store test specimens and accurately report the following information:

1. Name and Address of Laboratory
2. Date
3. Project Name
4. Project Location
5. Project Contractor
6. Concrete Supplier
7. Specified Strength at 28 Days
8. Type of Concrete
9. Time Sampled
10. Name of Person Performing Tests
11. Concrete Truck Number
12. Ticket Number
13. Size of Load
14. Weather Conditions
15. Slump of Concrete
16. Air Temperature
17. Concrete Temperature
18. Wet Weight of Concrete (not required for each sample)
19. Air Content of Concrete (not required for each sample)
20. Location of Concrete Placement
21. Specimen I.D. Number
22. Date Received in Lab
23. Date Tested
24. Age of Cylinders
25. Total Load
26. Compressive Strength
27. Weight of Cylinder
28. Remarks
29. Distribution of Reports

D. NOTE: If water is authorized by the Engineer of Record to be added to the concrete at the job site, list name of person authorizing the water added, quantity of water added, slump prior to adding water, and slump after adding water.

E. Notify the Architect/Structural Engineer and Project Superintendent immediately if the concrete fails to meet any part of the specifications.

F. Not used.

G. Provide a qualified technician with a minimum of two years experience.

H. Obtain concrete samples according to ASTM C172. Make tests for each 50 cubic yards of each type of concrete placed each day. Test the first batch of concrete placed for each type of concrete. Tests are not required for quantities of concrete less than six yards unless requested by the Architect/Structural Engineer. From the same batch used of fresh concrete, mold four specimens for compressive strength tests according to ASTM C39.

Determine slump according to ASTM C143. Determine air content according to ASTM C173. Determine fresh unit weight and yield per ASTM C567.

I. Perform one 7-day and two 28-day compressive strength tests as a single test. If the 28 day test does not indicate proper strength the fourth cylinder shall be broken at 45 or 60 days.

J. Examine concrete in truck to confirm that concrete is properly mixed.

K. Record the weight of each test cylinder.

L. Note on test reports if the Contractor was advised of concrete not meeting the specifications.

M. Note on test reports if water is added to the concrete by anyone during placement.

N. Additional tests due to the failure of any of the above tests, poor workmanship, or questionable concrete will be at the expense of the Contractor.

O. The following are the responsibility of the Contractor:

P. Notify the testing laboratory 24 hours prior to testing and inspection.

Q. Make premises available for testing and cooperate with testing agencies.

R. Notify Architect/Structural Engineer if material or workmanship does not conform to the specifications.

S. Provide storage area for test specimen per ASTM C31.

T. Advise Architect/Structural Engineer of improper testing procedures, unqualified personnel performing tests, unnecessary testing, or incorrect test results.

3.2 PLACEMENT OF CONCRETE

A. Deposit concrete as near as practical to final position. Maximum free fall shall be 3 feet unless proceeding is approved by Architect/Engineer. Do no following of concrete with vibrators.

1. Place thickened slabs for partitions integral with floor slabs and reinforce as shown on plans.

2. Use no aluminum equipment in placing and finishing concrete

3. Prepare place of deposit. Mix convey, place, and cure concrete in accordance with ACI 318. Wet forms before placing concrete.

3.3 TIME LIMIT

A. Deposit concrete within one hour after batching unless a longer time can be justified by favorable weather conditions. No concrete can be poured if more than 90 minutes of time has lapsed.

3.4 VIBRATION

A. Consolidate all concrete according to ACI 301.

3.5 TEMPERATURE PROVISIONS

A. Perform cold weather concreting in accordance with ACI 306. Perform hot weather concreting in accordance with ACI 605. Protect concrete from drying and excessive temperature for the first 7 days.

3.6 JOINTS

A. Obtain Architect/Structural Engineer's prior approval for use and location of construction joints. Provide construction joints according to ACI 318. Space joints in slabs-on-grade not over 20 feet apart and control joints not over 20 feet apart or as shown on the plans. Space construction joints or control joints for walls not over 20 feet apart or as shown on plans. Joint placement shall have approval of Architect/Engineer before

commencement of work.

3.7 CUTTING CONCRETE

A. Obtain Architect/Structural Engineer's written approval prior to cutting concrete for installation of other work.

3.8 DEFECTS

A. Notify Architect/Structural Engineer of defects in structural concrete before repairing.

3.9 PATCHWORK AND REPAIRS

A. Notify Architect/Structural Engineer of any defective areas in concrete prior to patching or repairing.

3.10 CONCRETE FINISHES

A. Concrete finishes shall conform to ACI 301.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or surfaces that are covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

E. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, and as otherwise indicated. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4" in 10' when tested with a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

F. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thin film finish coating system. After floating, begin final trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a trowel mark, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

J. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and

elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect and Owner's Representative before application.

K. Chemical-Hardener Finish: Reference Section 03 35 29 of these Specifications.

L. Burnished Finish: Burnish the concrete slab a minimum of 28 days after concrete placement with a high-speed propane burnishing machine equipped with an abrasive 3M Black stripping pad. If the surface is not relatively smooth it may be advantageous to first sand the surface with a 60-grit screen or sand paper prior to burnishing. If the floor does not shine when burnished it may be necessary to apply a standard treatment of Ashford Formula per manufactures instructions before proceeding with the burnishing process. Buff the concrete slab surface by working the machine side to side and back to create a wax like sheen. Repeat utilizing a 3M Red pad to increase the intensity of the sheen.

END OF SECTION

SECTION 03 35 29
CURING, SEALING, AND HARDENING CONCRETE FLOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Single application cure-seal-hardener for new concrete floors prior to wet-cure.
- B. Precautions for avoiding staining concrete before and after application.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete: Concrete slabs.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 23 Submittals.
- B. Material requirements for concrete to which cure-seal-hardener is to be applied, including cement type, water-cement ratio, type of trowel finish, limitations on admixtures, pigments, bonding agents, and bond breakers, etc.
- C. Product Data: Manufacturer's data sheets, including product specifications, test data, preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods.
- D. Maintenance instructions, including precautions for avoiding staining after application.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Applicator experienced with installation of product and Corporate Certified by manufacturer, or applicator experienced with similar products and providing manufacturer's field technician of site to advise on application procedures; and providing adequate number of skilled workers trained and familiar with application requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver product in factory numbered and sealed drums, with numbers recorded for Owner's records.
- B. Store products in manufacturer's unopened drums until ready for installation.

1.6 PROJECT CONDITIONS

- A. No satisfactory procedures are available to remove petroleum or rust stains from concrete. Prevention is therefore essential. Take precautions to prevent staining of concrete prior to application of cure-seal-hardener and for minimum of three months after application:
 - 1. Prohibit parking of vehicles on concrete slab.
 - 2. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
 - 3. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid, or other liquids.
 - 4. Prohibit pipe cutting using pipe cutting machinery on concrete slab.
 - 5. Prohibit temporary placement and storage of steel members on concrete slab.

- B. Do not install products under environmental conditions outside manufacturer's absolute limits.
- C. Do not use frozen material; thaw and agitate prior to use.

1.7 WARRANTY

A. Provide manufacturer's warranty that a structurally sound concrete surface prepared and treated according to the manufacturer's directions will remain permanently dustproof, hardened and water repellent. If after the specified sealing period the treated surface does not remain dustproof, hardened and water repellent, provide, at manufacturer's expense, sufficient material to reseal defective areas.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Curecrete Distribution, Inc; 1203 West Spring Creek Place, Springville, UT 84663. ASD. Tel: (800) 998-5664. Fax: (801) 489-3307. Email: techsupport@ashfordformula.com. www.ashfordformula.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 MATERIALS

- A. Cure-Seal-Hardener: Ashford Formula; water-based chemically-reactive penetrating sealer and hardener, that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, while allowing concrete to achieve full compressive strength, minimizing surface crazing, and eliminating dusting.
 1. Colorless, transparent, odorless, non-toxic, non-flammable.
 2. Containing no solvents or volatile organic compounds.
 3. USDA approved for food handling facilities.
 4. Allowing traffic on floors within 2 to 3 hours, with chemical process complete within 3 months.
 5. No change to surface appearance except a sheen developed due to traffic and cleaning.
- B. Water: Clean, potable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared and are suitable for application of product.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. If this is the applicator's first project using this product, provide the manufacturer's technical representative on-site to familiarize installers with proper procedures.
- C. Prevent damage to and soiling of adjacent work.
- D. New Concrete Prior to Wet-Cure:

Apply the Ashford Formula to new concrete as soon as the concrete is firm enough to work on after troweling, and all bleed water has dissipated.

1. Keep surfaces wet with the Ashford Formula for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather slipperiness may appear before the 30 minute time period has elapsed. If that occurs, apply more Ashford Formula as required to keep entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state.
2. After this period, when treated surface becomes slippery lightly mist with water until slipperiness disappears, agitate surface with a light bristle broom to redistribute the Ashford Formula evenly on the surface.
3. Wait for surface to become slippery again and then flush entire surface with water removing all residue of the Ashford Formula.
4. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
5. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.

3.4 PROTECTION

- A. Protect installed floors until chemical reaction process is complete; at least three months.
 1. Comply with precautions listed under PROJECT CONDITIONS.
 2. Clean floor regularly in accordance with manufacturer's recommendations.
 3. Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier.
- B. Precautions and cleaning are the responsibility of the General Contractor until Substantial Completion. Replace concrete that becomes stained due to improper precautions or lack of cleaning.

END OF SECTION

Section 04 22 00
REINFORCED UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Document Drawings, General Provisions of the Contract, including General and Supplementary Conditions, and DIVISION 1 of this Project Manual apply to the work of this section.
- B. Section 13 34 19 Pre-Engineered Steel Buildings
- C. Division 22 Plumbing
- D. Division 26 Electrical
- E. Division 28 Electronic Safety & Security

1.2 DESCRIPTION OF WORK:

- A. Extent of each type of reinforced unit masonry is indicated on the drawings.
- B. Grouted masonry, reinforced or non-reinforced, is included in this section.

1.3 SUBMITTALS:

- A. Submit all shop drawings for fabrication, bending, and placement of reinforcement bars.
- B. Show all bar schedules, diagrams of bent bars, stirrup spacing, lateral ties, and other arrangements and assemblies required for fabrication and placement of reinforcement for unit masonry work.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. General: Refer to Section 04 22 10 – Concrete Unit Masonry for masonry materials and accessories not included in this section.
- B. Reinforcement Bars: Provide deformed bars of following grades complying with ASTM A615, except as otherwise indicated:
 - 1. Grade 60 for bar Nos. 3 to 18, except as otherwise indicated.
 - 2. Where No. 2 bars are shown, provide plain, round, carbon steel bars, ASTM A675, Grade 80.
 - 3. Shop-fabricate reinforcement bars which are shown to be bent or hooked.
- C. Grout shall be 3,000 psi minimum. See paragraph 3.03.D of this section.

PART 3 - EXECUTION

3.1 PLACEMENT OF REINFORCEMENT:

- A. General: Clean reinforcement of loose rust, mill scale, earth, ice, or other materials which will reduce bonding to mortar or grout. DO NOT use reinforcement bars with kinks or bends if not specifically shown on the drawings or final shop drawings. DO NOT use bars with weakened cross-sections due to excessive rusting or other causes.

B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity provide a clear distance between bars of no less than the nominal bar diameter, or one [1"] inch (whichever is greater).

1. Provide a clear distance for columns, piers, and pilasters between vertical bars as indicated but no less than one and one-half [1½] times the nominal bar diameter or 1½" (whichever is greater). Provide lateral ties as indicated.

C. Splicing of Reinforcement Bars (where shown): DO NOT splice at other points unless acceptable to the Architect. Provide lapped splices unless otherwise indicated. When splicing vertical bars or attaching to dowels, lap ends, place in contact, and wire tie.

1. Provide no less than minimum lap shown; if not indicated, provide laps required by governing code(s).

D. As the work progresses, embed metal ties in mortar joints with a minimum mortar cover of 5/8" on exterior face of walls and ½" at other locations.

1. As the work progresses, embed metal ties in mortar with a minimum mortar cover of 5/8" on exterior face of walls and ½" at other locations. Lap units no less than six [6"] inches at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fire-roofing, pipe enclosures, and other special conditions.

E. Anchoring: Anchor reinforced unit masonry work to supported structures as indicated.

1. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

3.2 INSTALLATION - GENERAL:

A. Refer to Section 04 22 10 – Concrete Unit Masonry for general installation requirements of unit masonry.

B. Provide formwork and shores as required for temporary support of reinforced masonry elements.

C. Construct formwork to conform to shape, line, and dimensions shown. Construct formwork sufficiently tight to prevent leakage of mortar, grout, or concrete (if any). Brace, tie, and support as required to maintain position and shape during construction and curing of reinforced masonry.

D. DO NOT remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.

1. Allow for no less than the following minimum times to elapse after completion of members before removing shores or forms, provided suitable curing conditions have been obtained during the curing period:

- a. Ten [10] days for girders and beams.
- b. Seven [7] days for slabs.
- c. Seven [7] days for reinforced masonry soffits.

3.3 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY:

A. General:

1. DO NOT wet concrete masonry units (CMU's).

2. Lay CMU's with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face or unit to a distance behind face equal to no less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown or, if not shown, provide 3/8" joints. Where solid CMU's are shown lay with full

mortar head and bed joints.

B. Walls:

1. Pattern Bond: Lay CMU wall units in one-half [$\frac{1}{2}$] running bond with vertical joints in each course entered on units in courses above and below unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special shaped units where shown and as required for corners, jambs, sashes, control joints, lintels, bond beams, and other special conditions.
 2. Maintain vertical continuity of core or cell cavities which are to be reinforced and grouted to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
 3. Use special units or modify regular units where horizontal reinforced beams (bond beams) are shown to allow for placement or continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
- OPTION: Where all vertical cores are shown to be grouted the Contractor may elect to fill them with grout. If he opts to do this the requirements for mortar bedding of cross-webs and closing of core spaces below bond beams do not apply.

C. Columns, Piers, and Pilasters:

1. Use CMU's of the size, shape, and number of vertical core spaces shown. If not shown, use units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.
2. Provide pattern bond shown or, if not shown, alternate head joints in vertical alignment.

D. Grouting: Use fine grout, per ASTM C476, for filling spaces less than four [4"] inches in one or both horizontal directions.

1. Use course grout, per ASTM C476, for filling four [4"] inch spaces or larger in both horizontal directions.
2. Coordinate with Other Divisions of these Specifications and the Contract Document Drawings for descriptions and/or locations of systems and devices to be located within CMU partitions. Do not place grout in locations that prevent the installation of Other Systems.

E. Grouting Technique: The Contractor SHALL use low-lift grouting techniques, subject to modifications under the following requirements.

1. Provide a minimum clear dimension of two [2"] inches and clear areas of eight [8] sq.in. in vertical cores to be grouted.
2. Place vertical reinforcement prior to laying of CMU's. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters, or ten [10'-0"] feet.
3. Lay CMU's to maximum pour height. DO NOT exceed five [5'-0"] foot height or, if bond beam occurs below five [5'-0"] foot height, stop pour of course below bond beam.
4. Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one [1] hour. Terminate grout pours 1½" below top course of pour.
5. Bond Beams: Stop grout in vertical cells 1½" bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.
6. Coordination With Other Systems and Devices: Contractor is responsible for all coordination measures to insure that Other Systems included in the scope of work of the project are in place prior to grouting.

F. Not Used

G. High-Lift Grouting:

1. DO NOT USE high-lift grouting technique for grouting of CMU's unless minimum cavity dimension and area is three [3"] inches and ten [10] sq.in., respectively.
2. Provide clean-out holes in first course at all vertical cells which are to be filled with grout. Units with one [1] face shall be removed and temporary support for above units will be provided; or use header units with concrete brick supports, or cut openings in one face shell.
3. Construct masonry to full height of maximum grout pour specified prior to placing grout. Limit grout lifts to a maximum height of five [5'-0"] feet and grout pour to a maximum height of twenty-four [24'-0"] feet for single wythe hollow concrete masonry walls unless otherwise indicated.
4. Place vertical reinforcement before grouting. Place before or after laying masonry units as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU's over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters, or ten [10'-0"] feet. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends. Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing indicated.
5. Place horizontal joint reinforcement as the masonry units are laid.
6. Embed lateral tie reinforcement in mortar joints where indicated. Place as masonry units are laid, at vertical spacing shown. Where lateral ties are shown in contact with vertical reinforcement in mortar joints. Place as shown or, if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide no less than No. 2 bars 8-gauge wire ties spaced 16" O.C. for members with 20" or less per side dimensions, and eight [8"] inches O.C. for members with side dimensions exceeding twenty [20"] inches.
7. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry, and other foreign materials from grout spaces. Clean reinforcing and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close clean-out holes and brace closures to resist grout pressures.
8. DO NOT place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
9. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.
10. Limit grout pours to sections which can be completed in one working day without more than one [1] hour interruption of pouring operation. Place grout in lifts which do not exceed five [5'-0"] feet. Allow no less than thirty [30] minutes, nor more than one [1] hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation. Place grout in lintels or beams over openings in one [1] continuous pour.
11. Where bond beams occurs more than one [1] course below top of pour, fill bond beam course to within one [1"] inch vertically reinforced cavities during construction of masonry.
12. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1½" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

END OF SECTION

SECTION 04 22 10
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SCOPE:

A. Examine all Drawings, Specifications, General Conditions, Supplementary Conditions, and GENERAL REQUIREMENTS (DIVISION 1), which are a part of this Contract. Furnish all labor, materials, tools, equipment, scaffolding and other items necessary to complete all masonry work as shown on the Drawings and required herein, with all inclusions, inserts and provisions for inclusion, connection and passage of work under other sections of the specifications.

B. Furnish and install all masonry units required in new work complete with all component units, ties, inserts, reinforcing, etc. required for a total and finished masonry installation.

1.2 RELATED WORK:

A. Section 04 22 00 Reinforced Unit Masonry

B. For provisions on loose lintel and/or steel bearing plates, which are to be anchored to bear on masonry consult Section 05 12 23 - Miscellaneous Steel Fabrications.

C. Section 13 34 19 Pre-Engineered Steel Buildings

D. Anchors, anchor bolts, hangers, etc., as required by all sections.

E. Sleeves for all trades.

F. Frames for grilles or louvers that are in masonry walls.

1.3 GENERAL REQUIREMENTS:

A. Samples of all masonry materials shall be submitted to the Architect for approval. Results of effluorescence tests shall be submitted with sample.

B. Cutting and Patching shall be done after consulting all other trades in advance and make provisions for the installation of their work to avoid cutting and patching. Any cutting and patching of masonry required to accommodate work of others shall be done by this Contractor.

C. Cement and lime shall be stored in a manner so as to afford ready access for inspection, and in a suitable building so as to protect the material from dampness. All concrete blocks, after leaving the curing kiln, shall be stored under cover and protected from the weather at all times. At job site, unit masonry shall be stored on platforms, or in some other approved manner which will protect these materials from contact with the soil. At all times they shall be placed under cover, or otherwise protected from the weather.

D. Do not erect masonry when ambient temperature has dropped below forty-five [45] degrees Fahrenheit, unless temperature is on the rise. At no time erect masonry when temperature has dropped below forty [40] degrees Fahrenheit, unless permission is obtained in written form. When masonry work is authorized during temperatures below forty [40] degrees Fahrenheit, make provisions for heating and drying materials.

E. Lay masonry plumb and true to line so as to achieve level and accurately spaced courses. Break each course joint with course below, keeping head joints of alternate course in a straight vertical line. Lay corners and reveals plumb and true. Keep out-joints, etc., free from mortar and other debris.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Concrete Masonry Units shall be made of Portland cement, water and volcanic pumice, expanded slag, air-cooled slab, burned clay or burned shale aggregates conforming to ASTM 331, of uniform shapes and sizes, shown and required, of one manufacturer throughout the project, and shall be sound and free from cracks, chips, spalls, splits or other defects which may impair their strength or appearance. Load-bearing units shall conform to ASTM C-90, Grade N-1, and non-load-bearing units shall conform to ASTM C-129. All exposed block corners shall be bull-nosed.

B. Concrete Masonry Lintels in concrete masonry unit walls shall be fabricated, load-bearing masonry units of sizes and shapes as shown on the drawings. Lintels shall be built-in-place; and the jointing and texture of lintel units shall match the adjacent wall units.

C. Ties shall be of zinc-coated steel and conform to ASTM A153-60. The extent and location shall be as indicated on drawings and as herein specified.

1. Concrete masonry joint reinforcing shall be equal to Dur-O-Wal, as manufactured by Dur-O-Wal Products of Alabama, Inc. Furnish standard weight, truss-type, bright steel as required for wall thickness where used. Reinforcing shall be spaced sixteen [16"] O.C. vertically and run continuous within the horizontal joint. Corners cut and bent per manufacturer's recommendations to provide continuity.

2. Reinforcing Rods for lintels and other reinforcement not otherwise specified, consult ASTM A-15 or A-16 for provisions. Bar sizes shall be as shown (minimum size No. 4).

D. Mortar Materials: Reference Structural Drawing Sheet S1

PART 3 - EXECUTION

3.1 LAYING CONCRETE MASONRY UNITS:

A. Concrete block, where exposed in the final work, shall be laid with all care due finished walls. Do not expose any block with chipped, spalled or imperfect edges; make cuts with power masonry saw. It is intended that exposed concrete block surfaces to be neat, smooth, true, finished surfaces carefully laid.

B. Lay units in full beds of mortar, plumb, level and true to line, as detailed, and properly jointed with other connecting works. Make joints uniform, approximately three-eighths [3/8"] inch wide, and shall be concave tooled with a sled jointer.

C. Bond each course in eight by sixteen [8" x 16"] inch bond, as specified herein. All concrete masonry unit shall have continuous joint reinforcement, as specified herein, laid in every other horizontal mortar joint from floor to ceiling, except as noted otherwise. Lay joint reinforcement in all joints over openings on both sides. Lap joints at a minimum of six [6"] inches extended a minimum of twelve [12"] inches beyond openings on both sides. The reinforcements at corners shall be cut and bent per manufacturer's recommendations in order to provide continuity.

3.3 WORKMANSHIP:

A. Lay masonry plumb and true to line, with level, accurately spaced courses. Break each course joint with course below, keeping head joints of alternate course in straight vertical line. Lay corners and reveals plumb and true. Keep out-joints, etc. free from mortar and other debris.

3.4 BUILDING-IN:

A. Unless otherwise required, fill all spaces around metal door frames and other built-in items solidly with

mortar. Built-in work, is required to be built in with masonry, including anchors, wall plugs and accessories, conduits, electrical and plumbing devices, etc. as erection progresses.

3.5 JOINING:

A. Step back unfinished work for joining new work. Toothing may be resorted to only when so approved. Before new work is started, remove loose mortar, expose joint and wet thoroughly at least twelve [12] hours before laying new work.

3.6 PARTITIONS:

A. Unless otherwise noted, partitions shall extend to, and be finished tight, against structure above. Provisions shall be made for passage of ducts, pipes, conduit and other penetrations with close and neat pointing around them.

3.7 PROTECTION:

A. Protect masonry surface not being worked on during the construction work. This shall include all masonry projections, sills, steps, belting courses, etc., which shall be adequately covered from damage. this protection shall be maintained until final removal of same. Temporary protection shall be provided at the tops of all exterior walls and veneers at night and during inclement weather or during delays in the work. This protection shall be with a well secured waterproof membrane.

3.8 POINTING:

A. Upon completion of the work, point up all exposed masonry, fill all holes and joints, remove loose mortar, cut out defective joints and repoint where necessary.

3.9 MASONRY CLEANING:

A. Cleaner shall be a factory cleaner equal to Sure-Clean. Acid solutions will be used only if the factory-prepared cleaner fails to clean the masonry; acid solutions will be of the type that is not harmful to the masonry.
B. Brushes used in cleaning operations shall be stiff fiber brushes. Wire brushes WILL NOT be used.
C. Mix the cleaner with water as recommended by the manufacturer. Apply cleaner to surfaces and scrub with fiber brushes. After scrubbing surfaces, wash down with pure water. Operations shall be repeated until the surfaces are clean to the satisfaction of the Architect. Cleaning operations shall be conducted in a manner so as not to be harmful to masonry and in a manner that will not discolor the masonry.

END OF SECTION

SECTION 05 12 23
MISCELLANEOUS STEEL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Contract Document Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.
- B. Section 04 22 10 Concrete Unit Masonry
- C. Section 08 33 23 Overhead Coiling Doors
- D. Section 08 36 13 Sectional Overhead Doors
- E. Section 13 34 19 Pre-Engineered Steel Buildings
- F. Division 26 Electrical

1.2 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for products used in miscellaneous metal fabrications, including paint products and grout.
 - 2. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorages and accessory items. Provide templates for anchors and bolts specified for installation under other sections.
 - a. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation.
 - 3. Samples representative of materials and finished products as may be requested by Architect.
 - 4. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the work.
- B. Installer of Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.
- C. Qualify welding processes and welding operators: in accordance with AWS D1.1 "Structural Welding Code Steel, D1.3 "Structural Welding Code Sheet Steel," and D1.2 "Structural Welding Code Aluminum."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- D. Engineer Qualification: Professional engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

1.4 PROJECT CONDITIONS

- A. Field Measurement: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.
1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 PRODUCTS

2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
1. Galvanized finish for exterior installations and where indicated.
 2. Type S, Grade A, standard weight (schedule 40), unless otherwise indicated, or another grade or weight or both required by structural loads.
- D. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- E. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot dip galvanized per ASTM A 153.
- F. Welding Rods and Bare Electrodes: Selected in accordance with AWS specifications for the metal alloy to be welded.

2.2 GROUT AND ANCHORING CEMENT

- A. Non-shrink Nonmetallic Grout: Premixed, factory packaged, non-staining, non-corrosive, nongaseous grout complying with CE CRD C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following.
1. Non-shrink Nonmetallic Grouts:
 - a. "Bonsal Construction Group"; W.R. Bonsal Co.
 - b. "Diamon Crete Group"; Concrete Service Materials Co.
 - c. "Euco N S Grout"; Enclid Chemical Co.
 - d. "Kemset"; Chem Masters Corp.
 - e. "Crystex", L & M Construction Chemicals, Inc.
 - f. "Masterflow 713"; Master Builders
 - g. "Sealtight 588 Group"; W.R. Meadows, Inc.
 - h. "SonogROUT"; Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
 - i. "Stonecrete NM1"; Stonhard, Inc.
 - j. "Five Star Grout"; U.S. Grout Corp.

k. "Vibropruf #11"; Lambert Corp.

2.3 FASTENERS

- A. General: Provide zinc coated fasteners for exterior use or where build into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
- C. Lag Bolts: Square head type, FS FF B 561.
- D. Machine Screws: Cadmium plated steel, FS FF S 92.
- E. Wood Screws: Flat head carbon steel, FS FF S 111.
- F. Plain Washers: Round, carbon steel, FS FF W 92.
- G. Drilled In Expansion Anchors: Expansion anchors complying with FS FF S 325, Group VIII (anchors, expansion, non-drilling), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF B 575, Grade 5.
- H. Toggle Bolts: Tumble wing type, FS FF B 588, type, class, and style as required.
- I. Lock Washers: Helical spring type carbon steel, FS FF W 84.

2.4 PAINT

- A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast curing, lead free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field applied topcoats despite prolonged exposure complying with performance requirements of FS TT P 645. Coordinate with Division 09 PAINTING.
- B. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD P 21035 or SSPC Paint 20.

2.5 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrications and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 100 deg F. (55.5 deg C).
- D. Shear and punch metals cleanly and accurately, remove burns.
- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassemble and coordinated installation.
- K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 section.
- B. Fabrication items to sizes, shapes, and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.8 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of one inch per foot or clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.

2.9 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded

construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is place.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1 1/4 inches wide x 1/4 inch x 8 inches long.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot dip process compliance with the following requirements:
 1. ASTM A 153 for galvanizing iron and steel hardware.
 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

2.12 SCHEDULE OF ITEMS:

Supply and install metal fabrications as necessary for a complete installation of all project related components, complete with anchorage and attachments necessary for installation, inclusive of the following:

A. Steel Guard Posts (bollards): Provide and install as detailed and where located six [6"] inches round steel pipe, concrete filled, seven [7'-0"] feet long, set 36" deep in 16" round concrete filled post holes. Ship in prime coat. Finish painting shall be "Traffic Yellow" applied as follows:

1. Prime Coat: PPG Speedhide INT/EXT Rust Inhibitive Primer, 6-208 Series
 2. Finish Coats : Two Coats PPG Advantage 900
- Reference Contract Document Drawings for details

B. Steel Ladders: Provide and install steel ladders as detailed. Fabricate with 1½" O.D. steel pipe rails, 24" wide and 1" diameter steel rungs spaced 12" C.C. Extend both side rails 42" above elevated floor height and weld to adjacent guard rail sections on each side. Anchor ladder at top and bottom and at intermediate points not over six [6'-0"] feet apart with brackets of such length to hold the ladder eight [8"] inches off the wall. Finish painting shall be as follows:

1. Prime Coat: PPG Pitt-Tech INT/EXT DTM Industrial Primer/Finish 90 Series
 2. Finish Coats : Two Coats PPG Advantage 900
- Reference Contract Document Drawings for details

C. Handrails and Guardrails: Provide steel pipe, sizes as detailed, free of pits and abrasions. Connections shall be welded and ground smooth. Where detailed, provide pipe sleeves with welded bottom caps for setting handrails. Railing materials shall be hot-dip galvanized. Railings shall be designed to resist a horizontal thrust of fifty pounds per lineal foot applied to in any direction at the top. Finish painting shall be as follows:

1. Prime Coat: PPG Pitt-Tech INT/EXT DTM Industrial Primer/Finish 90 Series
 2. Finish Coats : Two Coats PPG Advantage 900
- Reference Contract Document Drawings for details.

D. Steel angles, beams and miscellaneous iron not otherwise specified shall conform to the Standard

Specifications of the ASTM A36, latest edition.

1. Pipe hanger support angles are included.
2. Lintels at masonry wall penetrations.
3. Roof opening angles over eighteen [18"] square.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instruction, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

- A. Fastening to In Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors as required. Connection to pre engineered steel building structure shall be as approved by Pre Engineered Steel Building manufacturer only.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with AWS Code for procedures of manual shielded metal arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.3 SETTING LOOSE PLATES

- A. Clean concrete bearing surfacing of any bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonmetallic nonshrink grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touch Up Painting: Cleaning and touch up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting" of these specifications.
- B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 07 21 00
INSULATION

PART 1 -GENERAL

1.1 SECTION INCLUDES:

- A. Polyisocyanurate Rigid Board Insulation
- B. Polystyrene Rigid Board Insulation.
- C. Fiberglass Batt Insulation
- D. Reference Section 13 34 19, Pre-Engineered Steel Buildings, for Batt Insulation by Pre-Engineered Steel Building Manufacturer.

1.2 RELATED DOCUMENTS

- A. Contract Document Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to work of this section.
- B. Section 13 34 19 Pre-Engineered Steel Buildings

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Polyisocyanurate Rigid Board Insulation: Equal to Atlas EnergyShield PRO ASTM C1289 Type I, Class I, Class A Fire Rated closed cell polyisocyanurate foam core acrylic coated aluminum foil faced rigid insulation board. ASTM E84 Flame Spread 25 or less. Install in accordance with ICC-ES ESR 1375 and manufacturers instructions with all taped or sealed panel joints, penetrations and openings for water resistive barrier configuration assembly. Provide standard 4' x 8' panels in thicknesses and locations as indicated on drawings and install with manufacturer approved mechanical fasteners.
- B. Polystyrene Rigid Board Insulation: Extruded Polystyrene (XPS) Rigid Foam Insulation equal to “Foamular” 250 ASTM C578 Type IV, 25 psi moisture resistant rigid foam board as manufactured by Owens Corning. Install in locations and thicknesses as indicated on the drawings.
- C. Fiberglass Batt Insulation: Unfaced thermal batt insulation equal to Thermal Batt FIBERGLAS Insulation as manufactured by Owens Corning. Flame spread rating of 25 or less ASTM E84. Install in locations and thicknesses as indicated on the drawings. Reference drawings for metal stud spacings.
- D. Pre Engineered Steel Building Manufacturer Wall and Roof Insulation: Reference Section 13 34 19, Pre Engineered Steel Buildings, and Contract Document Drawings.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Install all insulation products in accordance with manufacturers recommendations and using manufacturer approved fasteners and substrate materials.
- B. Store all insulation materials indoors until time of installation. If left outdoors for any period of time keep dry by covering completely with a waterproof tarpaulin..
- C. Follow manufacturers instructions for installation of cladding over any insulation materials.

END OF SECTION

SECTION 07 40 00
PRE-FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes preformed metal wall and roof panels, closures, and related trim

1.2 RELATED SECTIONS

A. Section 09 22 16, Metal Stud Framing (Non Structural)

B. Section 13 34 19 Pre-Engineered Steel Buildings

1.3 SUBMITTALS

A. Shop Drawings by manufacturer only, including the following:

B. Product Data

1. Manufacturer's data sheet including all accessories and fasteners

C. Samples

1. 36" long section of specified panel width and finish

2. 12" long section of continuous cleat

3. Color chart

D. Sample Warranties

1. Specified Sample Finish Warranty

1.4 INSTALLER QUALIFICATIONS

A. 10 years experience in the installation of metal panel wall systems

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect components using best practices to prevent abrasion damage, mechanical abuse, staining discoloration or corrosion during manufacturing, shipment and storage.

B. Secure panels where they are protected from wind and moisture, while allowing proper drainage and air circulation

C. Any unsatisfactory components will be rejected and/or reproduced to meet quality criteria

1.6 JOB CONDITIONS

A. Coordinate work with related or adjoining trades to prevent damage to stored or installed components

B. Verify acceptable storage loads on roof slopes

C. Precise location of all wall and roof penetrations shall be verified prior to final panel layout

1.7 QUALITY CRITERIA

- A. A792-96 – Specification for steel sheet, 55% Aluminum-Zinc Alloy coated by the hot-dip process
- B. E1592-95 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

1.8 WARRANTIES

- A. Finish/Substrate Warranty – provide manufacturer’s standard form 20 yr finish warranty stating that the finish will not peel, check, crack, chalk, or fade more than 5 E units.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Non Pre Engineered Steel Building Manufacturer furnished prefinished, concealed fastener, horizontal metal wall panels [**Identified on Drawings as WP-4**] shall be Aluminum -Zinc Alloy Coated (AZ-55 Galvalume) Steel Sheet, 24 Gauge, ASTM 792-08, Grade 40, yield strength 40 ksi minimum material. Finish shall be full strength Kynar 500 coating applied by the manufacturer on a continuous coil coating line, with a top side dry thickness of 0.75 +/- 0.05 mil prime coat, to provide a total top side dry film thickness of 0.95 +/- 0.10 mil. Bottom side shall be coated with a primer (non metallics only) and beige urethane coating with a total dry film thickness of 0.35 +/- 0.05 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500 finish supplier. Panel profiles shall be HR-16 ASTM E1592, installed horizontally in 40' max lengths, as manufactured by Berridge Manufacturing Company.
- B. Reference Section 13 34 19 Pre Engineered Steel Building Manufacturer furnished prefinished metal roof, wall, and liner panels and translucent wall panels.
- C. Substitutions shall fully comply with specified requirements in appearance, assembly, and performance and must be preapproved by the Architect in writing
 1. No post-bid substitution requests will be considered

2.4 ACCESSORIES

- A. Panel shall be attached to steel stud framing at a maximum spacing of 24” o.c.
- B. All fasteners for panel, trim, and supporting framing member attachment will be supplied by metal wall system manufacturer
- C. Trim and flashing will be of the same gauge and finish as the metal wall panel material.

PART 3 - EXECUTION

3.1 SUBSTRATE INSPECTION

- A. Determine, with the presence of the installer, that structural conditions are satisfactory for panel and trim installation.
- B. Conflicts resulting from inspection should be resolved prior to wall panel installation.

3.2 PANEL INSTALLATION

- A. Protective film should be removed prior to extended exposure to sunlight, heat, and other weather elements
- B. Panels should be handled at seams to prevent buckling
- C. Consult with adjoining trades to prevent unnecessary damage to the finish
- D. Install continuous length panels plumb, level, and straight with seams and ribs parallel
- E. Install panels without excessive waves, warps, or buckles

3.3 PANEL AND FLASHING INSTALLATION

- A. All trim shall be installed using the fastener type and spacing in accordance with manufacturer's instructions
- B. Fabricate and install sheet metal flashing in accordance with SMACNA manual
- C. In the process of sheet metal installation, allow no sealant to migrate onto exposed surfaces
- D. Any damaged product shall be removed and replaced immediately upon recognition
- E. Touch up paint should be used minimally for minor scratches. Major scratches or paint failures shall be recognized at damaged and require replacement
- F. Clean exposed surfaces upon completion of installation to prevent finish damage

END OF SECTION

SECTION 07 92 00
SEALANTS AND CAULKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Substrata surface preparation.
- B. Sealant and Caulking backing.
- C. Sealant and Caulking for general construction.
- D. Reference Section 13 34 19 Pre Engineered Steel Buildings for Sealants and Caulking furnished by Pre Engineered Steel Building Manufacturer.

1.2 RELATED SECTIONS

- A. Related Sections include the following:
 - 1. Section 04 22 10 Concrete Unit Masonry
 - 2. Section 13 34 19, Pre Engineered Steel Buildings, for Sealants and Caulking furnished by Pre Engineered Steel Building Manufacturer.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Manufacturers literature describing materials and application recommendations including requirements for joint preparation and primers.
- C. Samples:
 - 1. Submit color samples.

1.4 WARRANTY

- A. Warranty period for this work is for two years for cracking, spalling, leaching, delamination, disintegration, and durability by the manufacturer and applicator for material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Tremco Incorporated, Beachwood, OH.
- B. Pecora Corporation, Harleysville, PA.
- C. Sonneborn Building Products, Chem Res Inc., Minneapolis, MN.
- D. Firestone, Carmel, IN.

2.2 MATERIALS

- A. Exterior and interior joints subject to movement gun-grade polyurethane sealant shall be one of the following

types:

1. Tremco "Vulkem 921".
2. Pecora "Dynatrol I-XL".
3. Sonneborn "Sonolastic NP 2".

B. Interior/Exterior self-leveling polyurethane for horizontal joints shall be one of the following types:

1. Firestone "Pourable Sealant".
2. Tremco "Vulkem 45".
3. Pecora "NR-201 Urexpan".
4. Sonneborn "Sonolastic SL1".

C. Joint Filler: Shall be ethafoam backer rod extruded polyurethane foam as manufactured by Dow Chemical Corporation. In joints too small to use rod type backing material, architectural release tape shall be substituted.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify joint dimensions, physical, and environmental conditions are acceptable to receive work of this section.
- B. Beginning of installation means acceptance.

3.2 PREPARATION

- A. Clean, prepare, and size joints in accordance with manufacturers instructions. Remove any loose materials and other foreign matter which might impair adhesion of sealant.
- B. Verify that joint shaping materials and release tapes are compatible with sealant.
- C. Examine joint dimensions and size materials to achieve required width/depth ratios.
- D. Use joint filler to achieve required joint depths, to allow sealants to perform properly.
- E. Use bond breaker where required.

3.3 INSTALLATION

- A. Perform work in accordance with ASTM C804 for solvent release and C790 for latex base sealants.
- B. Install sealant in accordance with manufacturers instructions.
- C. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.
- D. Tool joints concave or as indicated.
- E. Joints: Free of air pockets, foreign embedded matter, ridges, and sags.

END OF SECTION

SECTION 08 10 00
DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior Hollow Metal Frames
- B. Interior Hollow Metal Doors
- C. Reference Section 13 34 19, Pre Engineered Steel Buildings, and Contract Document Drawings for exterior hollow metal doors and frames furnished by Pre Engineered Steel Building Manufacturer.

1.2 RELATED SECTIONS

- A. Section 04 22 10 Concrete Unit Masonry
- B. Section 13 34 19 Pre Engineered Steel Buildings
- C. Section 28 13 00 Access Control

1.3 REFERENCES

- A. All Products and Materials shall conform with the requirements of the most current version of the Tests and Standards as listed below, as well as, all applicable sections of the 2009 International Building Code.
 - 1. ANSI/ICC A 117.1 — American National Standard for Accessible and Usable Buildings and Facilities; International Code Council
 - 2. ANSI A250.3 — Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
 - 3. ANSI A250.8 — SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
 - 4. ANSI A250.10 — Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ASTM A 653/A 653M — Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2004A.
 - 6. NAAMM HMMA 840 — Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal manufacturers.
 - 7. NFPA 80 — Standard for Fire Doors and Fire Windows; National Fire Protection Association.
 - 8. UL 1784 — Standard for Air Leakage Tests Door Assemblies.

1.4 SUBMITTALS

- A. Section 01 33 23 Submittals
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, gauge and identifying location of different finishes, if any.
- D. Manufacturer's Installation Instructions: Indicate installation requirements and rough in dimensions.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Comply with ANSI A250.8 unless more stringent requirements are indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Store in accordance with NN840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.
- C. Follow special storage and handling requirements of manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Steel Doors and Frames:
 - 1. Ceco Doors Products: www.cecodoor.com
 - 2. Windsor Republic Doors: www.republicdoor.com
 - 3. Steelcraft: www.steelcraft.com
 - 4. Substitutions: Reference Division 1

2.2 DOORS AND FRAMES

- A. Requirements for All Door and Frames:
 - 1. Accessibility: Comply with ANSI/ICC A117.1.
 - 2. Door Top Closures: Flush with tip of faces and edges
 - 3. Glazed Lights: Non-removable stops on non-secure side, sizes and configurations as indicated on the drawings.
 - 4. Hardware Preparation: Concealed reinforcement: Reinforcement shall be 7-gauge at hinges, 16 gauge at locks, 12 gauge at flush bolts, 12 gauge at hold-open arms, 4 gauge at panic devices and 14 gauge at surface applied hardware. Reference Section 08 71 00, Door Hardware, and Section 28 13 00 Access Control for door and frame hardware prep requirements for electronic strikes and magnetic lock equipment. The Contractor is responsible for the preparation of all doors and frames in the scope of this project to receive specified hardware.
 - 5. Finish: Factory primed for field finishing
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirements, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict with the most stringent.

2.3 STEEL DOORS

- A. Exterior Doors
 - 1. Grade: ANSI A250.8; Level 3, physical performance Level A, Model 2, seamless.
 - 2. Thickness: 1-3/4 inches.
 - 3. Core: Polystyrene foam;

4. Closures: Flush with top of faces and edges.
5. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accord with ASTM A 653/A 653M.
6. Texture: Smooth faces
7. Finish: All surfaces must be thoroughly cleaned. Chemically treat metal surfaces with phosphate compound to assure maximum paint adherence. Factory primed with bake-on metal primer. All exterior doors to receive two finish coats of PPG Advantage 900 paint. Color as selected by the Architect.

B. Interior Doors, Non-Fire-Rated

1. Grade: ANSI A250.8; Level 3 physical performance Level A, Model 2, seamless.
2. Core: Mineral fiberboard; Vertical steel stiffeners
3. Thickness: 1-3/4 inches
4. Texture: Smooth faces
5. Finish: All surfaces must be thoroughly cleaned. Chemically treat metal surfaces with phosphate compound to assure maximum paint adherence. Factory primed with bake-on metal primer. All interior doors to receive two finish coats of PPG Advantage 900 paint. Color as selected by the Architect.

C. Interior Doors, Fire-Rated (if required):

1. Grade: ANSI A250.8; Level 3, physical performance Level A, Model 2, seamless.
2. Fire Rating: As indicated on drawings.
 - a. Provide units listed and labeled by UL
 - b. Attach fire rating label to each fire rated unit.
3. Smoke and Draft Control Doors: In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch w.g. pressure at both ambient and elevated temperatures; with "S" label in addition to fire label.
4. Core: Mineral Fiberboard; Vertical steel stiffeners
5. Texture: Smooth faces.
6. Finish All surfaces must be thoroughly cleaned. Chemically treat metal surfaces with phosphate compound to assure maximum paint adherence. Factory primed with bake-on metal primer. All interior doors to receive two finish coats of PPG Advantage 900 paint. Color as selected by the Architect.

2.4 STEEL FRAMES

A. General

1. Interior frames shall be 16 gauge cold-rolled steel
2. Exterior frames shall be 14 gauge cold-rolled steel
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames Wider than 48 inches. Reinforce with steel channel fitted tightly into frame head, flush with top.

B. Exterior Door Frames: Mitered Steel and fully welded and ground smooth.

1. Galvanized: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M.
2. Finish: All surfaces must be thoroughly cleaned. Chemically treat metal surfaces with phosphate compound to assure maximum paint adherence. Factory primed with bake-on metal primer. All exterior frames to receive two finish coats of PPG Advantage 900 paint. Color as selected by the Architect.

C. Interior Door Frames, Fire-Rated and Non-Fire-Rated: Mitered Steel and fully welded and ground smooth.

1. Fire Rating: Same as door, labeled

2. Finish: All surfaces must be thoroughly cleaned. Chemically treat metal surfaces with phosphate compound to assure maximum paint adherence. Factory primed with bake-on metal primer. All interior frames to receive two finish coats of PPG Advantage 900 paint. Color as selected by the Architect.

D. Mullions for Pairs of Doors: Removable type of profile similar to jambs.

2.5 ACCESSORY MATERIALS

A. Louvers: Where indicated shall be equal to Barber-Coleman Model GDV.

B. Glazing: Not Used

C. Glazed Openings: Not Used

D. Hardware: Reference Section 08 71 00 Hardware.

E. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited. Do not grout frames on doors that are specified to receive security access system devices (reference Hardware Schedule in Section 08 71 00 Hardware)

F. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

G. Temporary Frame Spreaders: Provide for all factory-or shop-assembled frames.

2.6 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, baked on.

B. Finish Paint: As specified in this Section and on the Contract Document Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating prior to installation.

3.3 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Not Used

E. Coordinate installation of hardware.

F. Coordinate installation of glazing.

G. Coordinate installation of electrical connections to electrical hardware and security access control items.

H. Touch up damaged factory finishes.

3.4 ERECTION TOLERANCES.

- A. Clearances Between Door and Frame: As specified in ANSI A250.8.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.5 ADJUSTING

- A. Adjust for smooth and balanced door movement.

3.6 RELATED DRAWINGS

- A. See Door, Frame & Hardware Legends and Schedules included in Drawings and Section 08 71 00 of these Specifications.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coiling doors.

1.2 RELATED SECTIONS

A. Section 05 12 23 – Miscellaneous Steel Fabrications: Miscellaneous steel supports.

B. Section 08 71 00 - Hardware: Door Schedule

C. Division 16 - Electrical connections and service for powered door operators.

D. Section 13 34 19 – Pre Engineered Steel Buildings

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 23 Submittals.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings:

1. Provide drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.
2. Regulatory Requirements and Approvals: Provide shop drawings in compliance with local Authority Having Jurisdiction (AHJ).

D. Certifications:

1. Submit manufacturer's certificate that products meet or exceed specified requirements.
2. Submit installer qualifications.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity, and trained and authorized by the door manufacturer to perform the work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Raynor, which is located at: 1101 East River Rd. P. O. Box 448 ; Dixon, IL 61021-0448; Toll Free Tel: 800-4-RAYNOR; Tel: 815-288-1431; Fax: 888-598-4790; Email: request info (thegarage@raynor.com); Web: www.raynor.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 COILING AND ROLLING DOORS

- A. DuraCoil as manufactured by Raynor Garage Doors:

- 1. Doors:

- a. Operation:

- 1) Provide doors designed for electric motor operation.

- b. Drive Orientation: Orient the drive from the following side when facing the side of the door that has the counterbalance or hood exposed:

- 1) Right-hand.

- c. Mounting: Door guide mounting configuration.

- 1) To face of wall on each side of door opening.

- d. Jamb Construction:

- 1) Steel jambs with self-tapping fasteners.

- e. Structural Performance Requirements:

- 1) Wind Loads: Uniform pressure of: 20psf.

- 2. Curtain: Interlocking roll-formed slats as specified below. Endlocks shall be attached to each of alternate slat to prevent lateral movement.

- a. Slat Type(s):

- 1) Insulated flat slat 22 gauge steel (0.030 inch minimum thickness) with 24 gauge steel back covers (0.023 inch minimum thickness).

- b. Color and Finish:

- 1) As selected by Architect from Manufacturer's standard color selections applied over one coat of primer.

- 3. Endlocks: Zinc-plated malleable cast iron endlocks fastened with two zinc-plated steel rivets.

- 4. Bottom Bar: Two angles, minimum 1-1/2 inches by 1-1/2 inches by 1/8 inch (38.1 mm x 38.1 mm x 3.2 mm) with single-contact type bottom astragal.

- a. Material:
 - 1) Structural steel angles.
- b. Color and finish:
 - 1) Structural angle bottom bar to receive one coat of black rust-inhibitive primer.
- 5. Guide Assemblies: Three structural angles, minimum 3 inches by 2 inches by 3/16 inch (76 mm by 50.8 mm by 4.8 mm) and fitted with removable curtain stops.
 - a. Material and Finish:
 - 1) Structural steel to receive one coat of black rust-inhibitive primer.
- 6. Guide Weatherseal: Seals to inhibit air infiltration between the guide and the curtain.
 - a. Snap-on dual durometer vinyl seal.
- 7. Counterbalance:
 - a. Barrel: Minimum 4-1/2 inches (114.3 mm) O.D. and 0.120 inch (3.1 mm) wall thickness structural steel pipe. Deflection of pipe under full load shall not exceed 0.03 inch (0.8 mm) per foot of span.
- 8. Enclosures:
 - a. Hood Type:
 - 1) Round Hood.
 - b. Bracket Covers: Covers to enclose door mechanisms.
 - c. Material:
 - 1) 24 gauge steel (0.022 inch minimum thickness) commercial quality hot-dipped galvanized (G-60) steel in accordance with ASTM A-653.
 - d. Color and Finish:
 - 1) White polyester paint to match curtain finish.
 - e. Hood Baffle: Provide hood baffle with a rubber seal to inhibit air infiltration through hood cavity.
- 9. Locks: Furnish door system with the following:
 - a. Locking Bar for Motor Operated Doors: Provide interlock switch with locking bar.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. Verify that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings are square, flush and plumb.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. General: Install door, track and operating equipment complete with all necessary accessories and hardware

according to shop drawings, manufacturer's instructions.

B. Lubricate bearings and sliding parts, assure weather tight fit around door perimeter and adjust doors for proper operation, balance, clearance and similar requirements.

3.4 PROTECTION

A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.

B. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.

C. Protect installed products until completion of project.

D. Touch-up, repair or replace damaged products before Substantial Completion.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: At Owner's request, provide manufacturer's field service consisting of product installation and use recommendations, and periodic site visits to observe and ensure product installation is done in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 08 36 13
OVERHEAD SECTIONAL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial sectional doors.

1.2 RELATED SECTIONS

A. Section 05 12 23 - Metal Fabrications: Miscellaneous for steel supports.

B. Section 08 71 00 - Door Hardware: Hardware Schedule

C. Div 16 - Electrical: Electrical connections and service for powered door operators.

D. Section 13 34 19 – Pre Engineered Steel Buildings

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM) A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. American Society for Testing and Materials (ASTM) C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. American Society for Testing and Materials (ASTM) E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 23.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings:

1. Provide drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.
2. Regulatory Requirements and Approvals: Provide shop drawings in compliance with local Authority having Jurisdiction (AHJ).

D. Certifications:

1. Submit manufacturer's certificate that products meet or exceed specified requirements.
2. Submit installer qualifications.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity, and trained and authorized by the door manufacturer to perform the work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Raynor, which is located at: 1101 East River Rd. P. O. Box 448 ; Dixon, IL 61021-0448; Toll Free Tel: 800-4-RAYNOR; Tel: 815-288-1431; Fax: 888-598-4790; Email: request info (thegarage@raynor.com); Web: www.raynor.com
- B. Requests for substitutions will be considered in accordance with provisions of **Section 01600**.

2.2 SECTIONAL THERMAL SANDWICH DOOR (POLYSTYRENE OR POLYURETHANE INSULATION)

A. TC Series as manufactured by Raynor Garage Doors:

1. Doors:

a. Operation:

- 1) Provide doors designed for electric motor operation.

b. Jamb Construction:

- 1) Steel jambs with self-tapping fasteners.

c. Structural Performance Requirements:

- 1) Wind Loads: Uniform pressure of: 20 psf.
- 2) Air Infiltration (ASTM E 283): Air leakage per foot of door perimeter (floor, jamb, and header) shall not exceed 0.81 CFM (22.9 L/Min) at 25MPH (40.2km/hr). No air leakage shall be detected between section joints when tested in accordance with ASTM E 283.

2. Sections:

a. TC300:

- 1) Sections shall be mechanically interlocked and pressure bonded to a 2-7/8 inches (73 mm) thick extruded polystyrene core. Hinge reinforcement plates shall be 16 gauge edge plates and 16 gauge center plates, located within section interior at every hinge location. End stiles to be 14 gauge galvanized steel.
- 2) Material: Steel sandwich construction, 3 inches (76mm) thick, roll formed from

commercial quality, hot-dipped galvanized (G60 exterior) steel complying with ASTM A 653. Exterior and interior skin to be constructed of 25 gauge steel (0.017 inch minimum thickness) embossed stucco texture.

3) Finish: Exterior skin to have two coats of paint, one primer coat and one finish coat.

a) Color: As selected by Architect from Manufacturer's standard color selections.

4) Insulation: Extruded polystyrene with R-value of 17.05.

b. Seals: Interior and exterior skins to be separated by continuous dual durometer vinyl seal held in place by mechanical interlock to form thermal break and complete weatherseal along section joint. Top of door to be provided with blade type sealing strip. Bottom of door to have flexible U-shaped vinyl seal retained in aluminum rail.

c. Trussing: Doors designed to withstand specified windload. Deflection of door in horizontal position to be maximum of 1/120th of door width.

3. Mounting: Sections mounted in door opening using:

a. Lap Jamb Angle Mounting: section overlap door jambs by 1 inch (25 mm) on each side of door opening.

4. Track:

a. Material: Hot-dipped galvanized steel (ASTM A 653), fully adjustable for adequate sealing of door to jamb or weatherseal.

b. Configuration Type:

1) Configuration Type: Normal Headroom.

c. Track Size:

1) Size: 3 inches (76 mm).

d. Mounting:

1) Floor-to-Header Angle-Mount consisting of continuous angle extending from the floor up to the door header for use with steel, wood, or masonry jambs. Continuous angle size not less than 2-5/16 inches by 4 inches by 3/32 inch (59 by 102 by 2.5 mm) on 2-inch track and 3-1/2 inches by 5 inches by 1/8 inches (89 by 127 by 3.2 mm) on 3-inch track.

e. Finish:

1) Galvanized.

5. Counterbalance:

a. Counterbalance System: Provided with aircraft-type, galvanized steel lifting cables with minimum safety factor of 5. Torsion Springs consisting of heavy-duty oil-tempered wire torsion springs on a continuous ball-bearing cross-header shaft.

1) Spring Cycle Requirements: Standard 10,000 cycles.

6. Hardware:

a. Hinges and Brackets: Fabricated from galvanized steel.

b. Track Rollers: 3 inches (76.2 mm) diameter consistent with track size, with hardened steel ball bearings.

c. Perimeter Seal: Provide complete weather stripping system to reduce air infiltration. Weather stripping shall be replaceable.

1) For angle mounted doors provide angle clip-on seal.

d. Locks: Key operated security locksets

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared. Verify that site conditions are

acceptable for installation of doors, operators, controls and accessories. Ensure that openings are square, flush and plumb.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. General: Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.

B. Lubricate bearings and sliding parts, and adjust doors for proper operation, balance, clearance and similar requirements.

3.4 PROTECTION

A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.

B. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.

C. Lubricate bearings and sliding parts, assure weather tight fit around door perimeter and adjust doors for proper operation, balance, clearance and similar requirements. Protect installed products until completion of project.

D. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

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 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
 - 2. Electrified hardware as indicated.
 - 3. Integrated access control hardware as indicated.
- B. Related Sections:
 - 1. Division 8: Steel Doors and Frames.
 - 2. Division 16: Electrical.
 - 3. Division 13 – Pre Engineered Steel Buildings
 - 4. Division 28: Electronic Safety and Security
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - 1. Permanent keys to be delivered to Owner.

1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - a. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.

- b. Manufacturer of each item.
- c. Fastenings and other pertinent information.
- d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
- e. Explanation of abbreviations, symbols, and codes contained in schedule.
- f. Mounting locations for door hardware.
- g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- D. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- E. Fire-Rated Door Assembly Testing: Per NFPA80, submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.4 QUALITY ASSURANCE

A. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying. Supplier recognized by manufacturers to be a direct, factory-authorized distributor of the specified hardware products.

- 1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant (AHC), active in the DHI Continuing Education Program with an up to date Seal, and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project. Go to <http://www.dhi.org/> to search list for local Architectural Hardware Consultants.

C Source Limitations: Obtain each type and variety of door hardware from the same single manufacturer, unless otherwise indicated.

- 1. Provide electrified door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

D. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
 - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Thresholds: Not more than 1/2 inch high.

3. International Building Code (2009).

- E. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
 1. To ensure compliance with Positive Pressure criteria as required by UBC7-2, UL10C, NFPA5000 and all applicable Local, State and National code Jurisdictions, all Doors and Frames should be checked for accurate installation per Manufacturers installation instructions to provide proper fire and Smoke Gasketing as tested and listed using a PL2 Frame Set Or similar Tool.

- F. Keying Conference: Conduct conference to comply with requirements in Division 1 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control system.
 4. Installation of permanent keys and cylinder cores.
 5. Address for delivery of keys.

- G. Pre-Installation Conference: Conduct conference at Project site attended by representatives of Supplier, Installer, and Contractor to review proper hardware installation methods and the procedures for receiving and handling hardware. At completion of installation, provide written certification that hardware items were applied according to conference recommendations and to finish hardware specifications.
 1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 2. Review sequence of operation for each type of electrified door hardware.
 3. Review and finalize construction schedule and verify availability of materials.
 4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard, electrified and access control hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Access Control and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and access control equipment with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.

1.7 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of standard, and electrified hardware that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods: Five years for bored latches and locksets, five years for exit devices, ten years for manual door closers.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B.Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware suppliers. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and the Door Hardware Schedule at the end of Part 3.
1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated for named products listed in Hardware Sets.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule. **(Source manufacturer listed in boldface).**

2.2 HINGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Butt Hinges:
 - a. **PBB, Inc. (PBB).**
 - b. Bommer Industries (BOM).
 - c. McKinney Products (MCK).
- B. Standards: BHMA Certified products complying with the following:
1. Butts and Hinges: BHMA A156.1.
 2. Template Hinge Dimensions: BHMA A156.7.
- C. Quantity: Provide the following, unless otherwise indicated:
1. Two Hinges: For doors with heights up to 60 inches.
 2. Three Hinges: For doors with heights 61 to 90 inches.
 3. Four Hinges: For doors with heights 91 to 120 inches.
 4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches (of door height greater than 120 inches).
- D. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum (inches)	Door Size	Hinge Height (inches)	Metal Thickness (inches)	Heavy Weight
			Standard Weight	
Up to 48 by 86 by 1-3/4		4-1/2	0.134	0.180
48 by 120 by 1-3/4		5	0.146	0.190

- E. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - 1. Exterior Doors: Heavy weight, non-ferrous, ball bearing hinges.
 - 2. Interior Doors: Heavy weight, steel, ball bearing hinges as Hardware Sets indicate.
- F. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
 - 1. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
 - a. Out-swinging security doors.

2.3 DOOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flush Bolts and Coordinators:
 - a. **Trimco Manufacturing (TRI).**
 - b. Burns Manufacturing (BUR).
 - c. McKinney Products (MCK).
- B. Standards: Comply with the following:
 - 1. Manual Flush Bolts: BHMA A156.16.
- C. Flush Bolts: BHMA Certified Grade 1.
- D. Provide manual flush bolts with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be 8” in length and U.L. listed for labeled fire doors.
- E. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
 - 1. Mortise Flush Bolts: Minimum 3/4-inch throw.

2.4 LOCKS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mechanical Bored Locks and Latches:

- a. **Corbin Russwin Architectural Hardware (COR) – CL3500 Series.**
 - b. Substitutions Not Allowed.
- B. Standards: Comply with the following:
 - 1. Bored Locks and Latches: BHMA A156.2.
- C. Bored Locks: BHMA Certified Grade 1, Series 4000.
- D. Lock Trim: Match the following design style:
 - 1. **Lever: Corbin Russwin Architectural Hardware (COR) - NZD Trim.**
- E. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
 - 1. Bored Locks: BHMA A156.2.
- F. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
- G. Backset: 2-3/4 inches unless otherwise indicated.

2.5 ELECTRIFIED LOCKS

- A. Manufacturers: Subject to same compliance standards and requirements as mechanical locksets, provide products by one of the following:
 - 1. Electromagnetic Locks: Electromagnetic locks shall be heavy duty, surface mounted type conforming to ANSI A156.23, Grade 1 with a minimum holding force of 1,200 lbs.. Locks shall be capable of either 12 or 24 voltage and be UL listed for use on fire rated door assemblies. Electronics are to be fully sealed against tampering and allow exterior weatherproof applications.
 - a. Rutherford Controls Inc. (RCI) - 8310 Series.
 - b. **Alarm Controls Corp. (ACC).**

2.6 CYLINDERS AND KEYING

- A. Provide security cylinders matching existing N8 Corbin Russwin Key System.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cylinders:
 - a. **Corbin Russwin Architectural Hardware (COR) – N8 Keyway.**
 - b. Substitution Not Allowed.
- C. Keys: Provide nickel-silver keys complying with the following:
 - 1. Quantity: Provide Keys as directed by Owner.

2.7 STRIKES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Electric Strikes:
 - a. Rutherford Controls Inc. (RCI) - 0162 Series.
 - b. **Hatchet Entry Systems (HES).**
- B. Standards: Comply with the following:
 - 1. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 2. Dustproof Strikes: BHMA A156.16.
 - 3. Electric Strikes: BHMA A156.5.
- C. Electric Strikes: BHMA Certified Grade 1.
- D. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece anti friction latchbolts, as recommended by manufacturer.
- E. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with combined products having unlimited lifetime warranty. All strikes to be fail secure.

2.8 EXIT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Exit Devices:
 - a. **Corbin Russwin Architectural Hardware (COR) - ED5200S Series.**
 - b. DORMA Architectural Hardware (DOR) – ED5000 Series.
 - c. Sargent Manufacturing (SAR) – 80 Series.
- B. Standard: BHMA A156.3.
- C. Exit Devices: BHMA Certified Grade 1.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Outside Trim: Match design for locksets and latchsets, unless otherwise indicated.

2.9 CLOSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one the following:
1. Surface-Mounted Closers (Standard Duty):
 - a. **DORMA Architectural Hardware (DOR) - 8616 Series.**
 - b. Corbin Russwin Hardware (C-R) - DC3200 Series.
 - c. Sargent Manufacturing (SAR) - 1430 Series.
 - d. LCN Door Closers (LCN) - 1461 Series.
- B. Standards: Comply with the following:
1. Closers: BHMA A156.4.
- C. Surface Closers: BHMA Certified Grade 1.
- D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide non-handed, factory-sized closers adjustable to meet field conditions and requirements for opening force.
- E. Closer Options: As indicated in hardware sets, provide door closer options including: delayed action, hold open arms, extra duty parallel arms, positive stop/hold open arms, compression stop/hold open arms, special mounting brackets, spacers and drop plates. Through bolt type mounting is required as indicated in the door hardware sets.

2.10 PROTECTIVE TRIM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Metal Protective Trim Units:
 - a. **Trimco Manufacturing (TRI).**
 - b. Burns Manufacturing (BUR).
 - c. McKinney Products (MCK).
- B. Standard: Comply with BHMA A156.6.
- C. Materials: Fabricate protection plates from the following:
1. Stainless Steel: .050 inches thick, beveled four sides (B4E) with countersunk screw holes.
- D. Fasteners: Provide manufacturer's designated fastener type as indicated in door hardware sets.
- E. Furnish protection plates sized two inches less than door width (LDW) on push side and by height specified in door hardware sets.

2.11 STOPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Stops and Holders:
 - a. **Trimco Manufacturing (TRI).**
 - b. Burns Manufacturing (BUR).
 - c. McKinney Products (MCK).

- B. Standards: Comply with the following:
 1. Stops and Bumpers: BHMA A156.16.
 2. Door Silencers: BHMA A156.16.

- C. Stops and Bumpers: BHMA Certified Grade 1.

- D. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
 1. Where floor or wall stops are not appropriate, provide overhead stops.

- E. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch fabricated for drilled-in application to frame. Provide (3) per single door and (2) per paired door frame.

2.12 GASKETING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Door Thresholds, Weatherstripping and Gasket Seals:
 - a. **Reese Products (REE).**
 - b. National Guard Products (NGP).
 - c. Zero International (ZER).

- B. Standard: Comply with BHMA A156.22.

- C. General: Provide continuous weatherstrip seal on exterior doors and smoke, light, or sound gasketing on interior doors where specified. Provide non-corrosive fasteners for exterior applications.
 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame. Install header seal before mounting door closer arms.
 2. Meeting Stile Astragals: Fasten to meeting stiles, forming seal when doors are closed.
 3. Door Sweep: Apply to bottom of door, forming seal with threshold when door is closed.

- D. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- E. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 1. Intumescent Seals and Gasketing: Provide concealed, Category A type gasketing systems on assemblies only where an intumescent seal is required by Door Manufacturer to meet IBC and UL-10C positive pressure labeling.

2.13 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

- A. Standard: Comply with BHMA A156.18.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
 1. BHMA 600: Primed for painting, over steel base metal.
 2. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
 3. BHMA 628: Satin aluminum, clear anodized, over aluminum base metal.
 4. BHMA 630: Satin stainless steel, over stainless-steel base metal.
 5. BHMA 652: Satin chromium plated over nickel, over steel base metal.
 6. BHMA 689: Aluminum painted, over any base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance using a PL2 Frame Set or similar Tool. For Tool information, consult <http://www.PL2frameset.com>.
- B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with ANSI/BHMA A115 series.

C. Electrified Openings: Provide steel doors and frames prepared to receive electrified hardware connections specified in Door Hardware Sets without additional modification.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and re-installation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Secure the services of an Architectural Hardware Consultant (AHC) to perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

1. Architectural Hardware Consultant will inspect all swinging doors and hardware immediately following completion of installation and state in report whether installed work complies with or deviates from specifications or construction document requirements.

- a. Inspection Scope:

- 1) Inspect all swinging doors and door hardware.
 - 2) Inspector to furnish a Field Quality Report, itemized per each individual opening, to the Architect within 7 days of the inspection, including:
 - a) Deficiencies in workmanship and standard industry practices.
 - b) Use of allowable products.
 - c) Use of manufacturer recommended fasteners.
 - d) Compliance with the ADA.
 - e) Proper door/frame/hardware clearances.
 - f) Problems related to function, security, aesthetics, or maintenance.

- b. Inspector Qualifications:

- 1) Certified Architectural Hardware Consultant.
 - 2) Entirely independent of the supply side of the project, having no familial or financial relationship with any manufacturer, manufacturer's representative, distributor, installer or supplier used on this project.
 - 3) Full-time (40 hours per week) engaged in the writing of hardware specifications and on-site inspections.
 - 4) Approved by Architect. Go to <http://www.dhi.org/> to search list for local Architectural Hardware Consultants.

B. Field Inspection: Secure the services of an Access Control System Consultant to perform a final inspection of installed access control door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

1. Access Control System Consultant will inspect integrated electronic and access control hardware and state in report whether installed work complies with or deviates from requirements, including whether electronic and access control hardware is properly installed and performing according to system operational descriptions.
 - a. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
 - b. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Replace malfunctioning or damaged items with new items.
 - c. Acceptance Test Schedule: Schedule tests after pre-testing has been successfully completed and system has been in normal functional operation for at least 2 weeks.
 - d. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Fire-Rated Door Assembly Testing: Upon completion of the installation, each fire door assembly in the project shall be tested to confirm proper operation of its closing device and that it meets all criteria of a fire door assembly as per NFPA80 2007 Edition. The inspection of the fire doors is to be performed by individuals with knowledge and understanding of the operation components of the type of door being subjected to testing who are acceptable by the Authority Having Jurisdiction (AHJ). A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The record shall list each fire door assembly throughout the project, and include each door number, and itemized list of hardware set components at each door opening, and each door location in the facility.

C. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper finish. and provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Secure the services of a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.
- B. Secure the services of a Certified Fire Door Assembly Inspector to complete inspection requirements per NFPA 80 2007 Chapter 5.2.

3.8 DOOR HARDWARE SETS

- A. The hardware sets listed below represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.

HARDWARE SETS

Hardware Set #01
 Single 3'0" x 7'0" x 1 3/4" HM x HM
 Openings #07, 12
 Each opening to have:

3 Each	Hinge	4B81 4 1/2" x 4 1/2" NRP	626	PBB
1 Each	Exit Device	ED5200S x N759 x N8 x Mk'd	626	COR
1 Each	Electric Strike	#0162 Rim Strike	630	RCI
1 Each	Door Closer	8616 SDS FC	689	DOR
1 Each	Kickplate	K0500 10" x 34" B4E	630	TRI
1 Each	Door Sweep	967C 36"	628	REE
1 Set	Gasket	797B 3684	Black	REE
3 Each	Silencer	1229A	Grey	TRI
1 Each	Floor Stop	W1211	630	TRI
1 Each	Card Reader	by Security Contractor		
1 Each	Power Supply	by Security Contractor		

Note: All Wire and Wire Connections by Electrical/Security Contractor.

Hardware Set #02
 Pair 6'0" x 7'0" x 1 3/4" HM x HM
 Opening #10

Each opening to have:

6 Each	Hinge	BB81 4 ½" x 4 ½" NRP	626	PBB
1 Each	Lockset	CL3557 NZD x N8 x Mk'd	626	COR
1 Each	Lock Guard	5002	630	TRI
1 Each	Door Closer	8616 SDS FC	689	DOR
1 Set	Flush Bolts	3917	626	TRI
1 Each	Magnetic Lock	8310	628	RCI
2 Each	Kickplate	K0500 10" x 34" B4E	630	TRI
2 Each	Door Sweep	967C 36"	628	REE
1 Each	Astragal	183SP x 797B 84"	Prime	REE
1 Set	Gasket	797B 7284	Black	REE
2 Each	Silencer	1229A	Grey	TRI
1 Each	Card Reader	by Security Contractor		
1 Each	Power Supply	by Security Contractor		

Note: All Wire and Wire Connections by Electrical/Security Contractor.

Hardware Set #03

Pair 6'0" x 7'0" x 1 ¾" HM x HM

Opening #9

Each opening to have:

6 Each	Hinge	BB81 4 ½" x 4 ½"	626	PBB
1 Each	Lockset	CL3557 NZD x N8 x Mk'd	626	COR
1 Each	Door Closer	8616 SDS FC	689	DOR
1 Set	Flush Bolts	3917	626	TRI
2 Each	Kickplate	K0500 10" x 34" B4E	630	TRI
2 Each	Door Sweep	967C 36"	628	REE
1 Each	Astragal	183SP x 797B 84"	Prime	REE
1 Set	Gasket	797B 7284	Black	REE
2 Each	Silencer	1229A	Grey	TRI

Hardware Set #04

Single 3'0" x 7'0" x 1 ¾" HM x HM

Openings #18, 19

Each opening to have:

3 Each	Hinge	BB81 4 ½" x 4 ½"	626	PBB
1 Each	Lockset	CL3557 NZD x N8 x Mk'd	626	COR
1 Each	Kickplate	K0500 10" x 34" B4E	630	TRI
1 Set	Gasket	797B 3684	Black	REE
3 Each	Silencer	1229A	Grey	TRI
1 Each	Floor Stop	W1211	630	TRI

Hardware Set #05

Single 3'0" x 7'0" x 1 ¾" HM x HM

Openings #01, 06, 13

Each opening to have:

3 Each	Hinge	4B51 4 1/2" x 4 1/2" NRP	630	PBB
1 Each	Exit Device	ED5200S x N759 x N8 x Mk'd	630	COR
1 Each	Electric Strike	#0162 Rim Strike	630	RCI
1 Each	Door Closer	8616 SDS FC	689	DOR
1 Each	Kickplate	K0500 10" x 34" B4E	630	TRI
1 Each	Door Sweep	967C 36"	628	REE
1 Set	Gasket	957C 3684	628	REE
3 Each	Silencer	1229A	Grey	TRI
1 Each	Threshold	S483A 36" 1/4-20 SSMSA	Alum	REE
1 Each	Card Reader	by Security Contractor		
1 Each	Power Supply	by Security Contractor		

Note: All Wire and Wire Connections by Electrical/Security Contractor.

Hardware Set #06

Single Overhead Door Steel x Steel

Openings #02, 03, 04, 05, 08, 11, 14, 15, 16, 17

Each opening to have:

All Door, Frame, and Hardware complete by Overhead Door Manufacturer/Supplier.

END OF SCHEDULE

END OF SECTION

SECTION 09 22 16
METAL STUD FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Formed metal stud framing.
- B. Framing accessories.

1.2 RELATED SECTIONS

- A. Section 07 21 00 Insulation
- B. Section 07 40 00 Pre Formed metal Wall Panels
- C. Section 13 34 19 Pre Engineered Steel Buildings

1.3 REFERENCES

- A. ASTM A591 - Steel Sheet, Cold-Rolled, Electrolytic Zinc-Coated.
- B. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track) and Rigid Furring Channels For Screw Application of Gypsum Board.
- C. ASTM C754 - Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board, or Water-Resistant Backing Board.
- D. GA 203 - Installation of Screw-Type Steel Framing Members to Receive Gypsum Board.

1.4 SYSTEM DESCRIPTION

- A. Maximum Allowable Deflection Non Load Bearing Partitions: 1/270 span.
- B. Maximum Allowable Deflection Load Bearing Partitions: 1/360 span.
- C. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- D. Vertical Assembly Design Load: 35 PSF

1.5 SUBMITTALS

- A. Section 01 33 23 - Submittals
- B. Product Data: Submit data describing standard framing member materials and finish, product criteria, load charts, limitations.
- C. Installation Instructions: Submit printed manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with GA203 and ASTM C754.

PART 2 PRODUCTS

2.1 STUD FRAMING MATERIALS

- A. Interior Partition Studs: ASTM A591, electro-galvanized, non-load bearing rolled steel, channel shaped, punched for utility access, as follows:
 - 1. Width: As indicated on Drawings.
 - 2. Thickness: 25 gage
- B. Exterior Studs: ASTM A446 sheet steel, galvanized coating class, minimum yield 40KSI, channel shaped, punched for utility access, widths as indicated on drawings as follows:
 - 1. Exterior non-load bearing studs: 20 gage
 - 2. Exterior load bearing studs: 18 gage
- C. Runners: Same material and finish as studs, bent leg retainer notched to receive studs. Ceiling runners with extended legs.
- D. Furring and Bracing Members: Same material and finish as studs, thickness to suit purpose.
- E. Fasteners: GA 203. Self-drilling, self-tapping screws.
- F. Anchorage Devices: Power driven or Powder actuated, as required.
- G. Primer: FS TT-P-645, for touch-up of galvanized surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 77 19 - Contract Closeout Requirements
- B. Verify that conditions are ready to receive work.
- C. Verify that rough-in utilities are in proper location.
- D. Beginning of installation means installer accepts existing conditions.

3.2 ERECTION

- A. Align and secure top and bottom runners at 24 inches.
- B. Fit runners under and above openings; secure intermediate studs at splicing of wall studs.
- C. Install studs vertically at spacing as indicated on drawings.
- D. Connect studs to tracks using fastener method.
- E. Stud splicing not permissible.
- F. Construct corners using minimum three studs.
- G. Double studs at wall openings, door and window jambs, and not more than 2 inches each side of openings.
- H. Brace stud framing system and make rigid.
- I. Coordinate erection of studs with requirements of door and window frame support and attachments.
- J. Align stud web openings.
- K. Coordinate installation of bucks, anchors, and blocking with electrical and mechanical work to be placed in or behind stud framing.
- L. Blocking: Secure wood blocking to studs. Secure steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and handrails.
- M. Refer to Drawings for indication of partitions extending to ceiling only and for partitions extending through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
- N. Coordinate placement of insulation in multiple stud spaces made inaccessible after stud framing erection.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch.
- B. Maximum Variation of any Member from Plane: 1/16.

3.4 SCHEDULE

- A. Wall Types and Locations: as indicated on drawings.

END OF SECTION

SECTION 13 34 19
PRE-ENGINEERED STEEL BUILDINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Design, fabricate and erect the pre-engineered steel building, including:
1. Structural steel main building frames
 2. Secondary framing including purlins and girts
 3. Roof and wall panels and trims
 4. Gutter and downspouts
 5. Overhangs
 6. Exterior personnel doors and frames
 7. Roof ventilators
 8. Translucent panels
 9. Insulation

1.2 RELATED SECTIONS

- A. Related Documents, Sections, and Divisions in these Specifications include the following:
1. Shelby County General Conditions of the Contract for Construction
 2. Section 01 11 13 – Summary of Work
 3. Section 01 33 23 - Submittals
 4. Section 03 30 00 – Cast In Place Concrete
 5. Section 04 22 00 – Reinforced Unit Masonry
 6. Section 05 41 00 – Structural Metal Stud System
 7. Section 07 21 00 – Insulation (Other than that provided by Pre-Engineered Steel Building Manufacturer)
 8. Section 07 42 13 – Pre Formed Metal Wall Panels (Other than that provided by Pre-Engineered Steel Building Manufacturer)
 9. Section 08 33 23 – Overhead Coiling Doors
 10. Section 08 36 13- Overhead Sectional Doors
 11. Division 15 - Mechanical
 12. Division 16 - Electrical
 13. Division 22 - Plumbing
 14. Contract Document Drawings

1.3 REFERENCES

- A. All Products and Materials shall conform with the requirements of the most current version of the Tests and Standards as listed below, as well as, all applicable sections of the 2009 International Building Code.
1. AISI – North American Specification for the Design of Cold-Formed Steel Structural Members - 2007 Edition
 2. ANSI/AISC 360-05 - Specification for Structural Steel Buildings, ASD 2005, 13th Edition, and Steel Design Guide Series 3 - Serviceability Design Considerations for Low-Rise Building – second edition 2003

Equipment Storage Building

3. ASTM A36 - Specification for Carbon Structural Steel
4. ASTM A325 - Specification for Structural Bolts, Steel, Heat Treated
5. ASTM A475 - Specification for Zinc-Coated Steel Wire Strand
6. ASTM A529 - Specification for High-Strength Carbon-Manganese Steel of Structural Quality
7. ASTM A572 - Specification for High Strength Low-Alloy Columbium-Vanadium Steel
8. ASTM A1011 SS or ASTM A1011HSLAS - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
9. ASTM A792 - Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process
10. ASTM A992 - Specification for Structural Steel Shapes
11. ASTM D1494 - Test Method for Diffuse Light Transmission Factor of Reinforced Plastic Panels
12. ASTM D2244 - Practice for Calculation of Color Differences from Instrumentally Measured Color Coordinates
13. ASTM D4214 - Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
14. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials
15. ASTM E283 - Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
16. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
17. ASTM E1592 - Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
18. ASTM E1646 - Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
19. ASTM E1680 - Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems
20. AWS A2.4 - Standard Welding Symbols
21. AWS D1.1 - Structural Welding Code - Steel
22. AWS D1.3 - Structural Welding Code - Sheet Steel
23. FM4471 – Factory Mutual Research Corporation Standard 4471 Class 1
24. IAS - International Accreditation Service, Inc.
25. MBMA Metal Building Systems Manual - 2006 Edition
26. NAIMA 202 - Standard for Flexible Fiberglass Insulation Systems in Metal Buildings
27. UL 580 - Underwriters Laboratory -Tests for Uplift Resistance of Roof Assemblies
28. UL 790 – Underwriters Laboratory – Test Methods for Fire Tests of Roof Coverings
29. UL 2218 Underwriters Laboratory – Impact Resistance of Prepared Roof Covering Material
30. SSPC-SP2 - Steel Structures Painting Council, Surface Preparation Specification No. 2, Hand Tool Cleaning

1.4 SYSTEM DESCRIPTION

The building shall include all primary and secondary structural framing members, connection bolts, roof and wall covering, trim, fasteners, closures, sealer, flashings, canopies, roof extensions, windows, doors, skylights, insulation, gutters, downspouts, louvers, ventilators and other miscellaneous items as stated in the specifications and/or shown or called for on the drawings.

- A. Primary framing shall consist of transverse rigid frames of rafters and columns with solid webs. The rigid frame shall be fabricated of shop-welded steel plate and designed for erection by field bolting. Frames shall be:
1. clear span

2. gabled
 3. with uniform depth exterior columns.
- B. Secondary framing shall consist of purlins, girts, eave struts, flange braces and sag angles as required by design.
- C. Horizontal loads not resisted by main frame action shall be resisted by
1. standard cable or rod x-bracing in the roof
 2. standard cable or rod x-bracing, rigid portal frames, or shearwall by others in the sidewalls
 3. panel diaphragm, standard cable or rod x-bracing, rigid portal frames, or shearwall by others in the endwalls
- D. Roof and Wall System consists of preformed steel panels, trim, flashings and accessories as required for a complete installation.
- E. Building overall dimensions, bay spacing, post spacing, eave height, clear dimensions and roof pitch shall be as indicated on the drawings and as defined here.
1. The building "Width" shall be the measurement from outside face to outside face of the sidewall girts.
 2. The building "Length" shall be the measurement from outside face to outside face of the endwall girts.
 3. "Eave" to be determined as the line along the sidewall formed by the intersection of the planes of the roof and sidewall.
 4. "Eave Height" is defined as the vertical dimensions as measured from the finished floor to the top of the eave strut.
 5. The "Bay Spacing" shall be the distance between the centerlines of frames for interior bays and the distance from the outside face of endwall girt to the centerline of the adjacent interior frame for end bays.
 6. The "Module Spacing" shall be measured between the centerlines of interior columns for interior modules and the distance from the outside face of sidewall girts to the centerline of the adjacent interior column
 7. "Roof Pitch" shall be the inches of vertical rise per inches of horizontal run, expressed as inches of rise per 12 inches of run.

1.05 DESIGN REQUIREMENTS

- A. Design primary and secondary structural members and exterior covering materials for applicable load and combinations of loads in accordance with the 2006 International Building Code. Design loads shall be combined to produce maximum stresses within the structure in accordance with AISC and/or AISI as they apply.
- B. The design loads plus Dead Load shall be used in the structure design.
1. Roof Live Load shall be applied on the horizontal projection of the roof. Live Load reduction shall be applied according to the code specified above.
 2. Wind Load shall be applied as pressure and suction in accordance with standard design criteria.
 3. The Roof Snow Load shall be applied on the horizontal projection of the roof.
 4. The Ground Snow Load shall be used with the exposure factor, thermal factor, slope factor and importance factor to determine the Roof Snow Load.
 5. The metal building system shall be designed for snowdrift conditions if required based on location of the facility.
 6. Collateral loads shall be those other than the basic design loads for which the building must be adequately designed. Loads of this type include, but shall not be limited to, suspended ceilings, sprinkler, electrical or mechanical systems, or any suspended or roof mounted HVAC units.
- C. The building components shall be designed to the following minimum deflection requirements, unless a specific deflection is required by the building code. Deflection based on wind shall be based on a 10 year map,

or 75% or the design pressure for a 50 year map.

1. Frame rafters – L/180
2. Frame sidesway – H/60
3. Purlins – L/150
4. Girts – L/120
5. Endwall posts – L/120
6. Roof panel – L/150
7. Wall panel – L/120

1.06 SUBMITTALS

A. Erection Drawings including:

1. Anchor bolt setting plan, base plate details and column reactions
2. Roof framing plan
3. Wall framing elevations
4. Transverse cross sections
5. Panel layout
6. Exact location of factory located openings
7. Approximate location of field located openings
8. Framing details
9. Flashing details
10. Accessory details

B. Design calculations, stamped by a Professional Engineer registered in the state of Tennessee including:

1. Stress analysis
2. Deflection analysis
3. Foundation loads for each loading case

C. Letter of Certification, prepared and signed by a Professional Engineer licensed in the State of Tennessee, verifying that building design meets indicated loading requirements and building code as requested.

1.07 QUALIFICATIONS

A. The company manufacturing the products specified in this Section shall:

1. be a member of MBMA
2. be accredited under the International Accreditation Service, “Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems (AC472)
3. have a minimum of 20 years experience in the manufacture of steel building systems

B. Acceptable Manufacturers

1. Bigbee Steel Buildings, Inc.

C. Erector's Qualifications

1. Minimum of 5 years experience in this or similar trade
2. Five similar installation references in past 3 years

1.08 WARRANTY

A. The metal building manufacturer shall warrant for 5 years that components were free from defects in composition of material and workmanship and in accordance with industry standard for such components.

B. Unpainted Galvalume® panels shall be warranted by the metal building manufacturer for 25 years against

rupture, perforation, or structural failure as a result of corrosion caused by exposure to normal atmospheric conditions.

C. The exterior color finish of factory coated roof panels shall be warranted by the metal building manufacturer for 20 years against peeling, cracking, checking, and flaking. Color as selected by Architect from Manufacturer's standard color selections.

D. The exterior color finish of factory coated wall panels shall be warranted by the metal building manufacturer for 20 years against peeling, cracking, checking, and flaking. Color as selected by Architect from Manufacturer's standard color selections.

E. Provide the owner with a copy of all warranties.

PART 2 PRODUCTS

2.01 MATERIALS – STRUCTURAL FRAMING

A. General

1. Structural steel members shall be sheared, plasma cut, formed, punched, welded and painted in the plant of the manufacturer. All shop connections shall be welded in accordance with the AWS "Standard Code for Welding in Building Construction".
2. All structural framing members shall be prepared according to SSPC-SP2 and given one shop coat of standard red oxide primer.
3. All framing members shall carry an easily visible identifying mark to aid the erector in the erection of the building.
4. Field connections shall be bolted with high strength bolts and nuts.

B. Primary Structural Members

1. The primary structural members shall be rigid framing manufactured of solid web members having tapered rafters rigidly connected to uniform depth columns.
2. Steel used to fabricate built up framing members shall be 55,000 PSI minimum yield point material and shall conform to the physical characteristics of ASTM A1011, ASTM A572 or ASTM A529, Grade 55.
3. Steel used for interior pipe columns, if required, shall be 35,000 PSI minimum yield point material.
4. The building manufacturer shall have on file certified mill test reports that verify that these requirements have been met.

C. Secondary Structural Members

1. Secondary structural framing shall distribute the loads to the primary structural system and shall include endwall columns and rafters, purlins, girts, eave struts, base support, headers, jambs, flange bracing, clips, and other miscellaneous structural framing.
2. Steel used for cold-formed members shall be 55,000 PSI minimum yield point material and shall conform to the physical characteristics of ASTM A1011 Grade 55.
3. Light gauge cold-formed sections shall be manufactured by precision roll or brake forming. All dimensions shall be true, and the formed member shall be free of fluting, buckling or waviness.
4. Endwall rafters shall be manufactured from roll formed or built-up sections of adequate size and thickness as determined by the design criteria.
5. Endwall columns shall consist of roll formed or built-up sections of adequate size and thickness as determined by the design criteria.
6. Purlins and girts shall be precision roll-formed 8" or 10" deep "Z" sections of adequate size and thickness as determined by the design criteria, minimum 16 gauge. Purlins and girts shall be either simple span or continuous span members.

7. Eave struts shall be precision roll-formed and/or press brake formed "C" sections, minimum 14 gauge. The upper flange shall slope with the normal roof slope, and the web shall be vertical and free to receive the sidewall covering.
8. Base support shall consist of a continuous base angle, base "C", or an 18 gauge one piece base member to which the base of the wall covering shall be attached. The base support shall be securely fastened into the concrete by the erector.
9. Headers and jambs shall be precision roll-formed "C" sections of the same depth as the girts.
10. Flange bracing shall consist of angle members connected to the web of the purlin or girt and to the compression flange of the primary structural member.
11. Clips shall be fabricated from 55,000 PSI minimum yield point material and be factory punched for field bolted connections.

D. Bracing

1. Horizontal load resisting bracing shall be accomplished by diagonal cable bracing, rod bracing, portal frames, and/or diaphragm action of the roof and wall covering.
2. All cables for diagonal bracing shall be fabricated from extra high strength Grade-7 wire Class A coating, left hand lay, galvanized steel strand, conforming to the provisions of ASTM A475. Adjustment shall be provided by an eyebolt assemble.
3. Rod bracing shall be fabricated from minimum 5/8" diameter steel rod conforming to the provisions of ASTM A36.
4. Portal frames shall be fabricated of built-up sections and conform to the same specifications as primary framing.

2.02 MATERIALS – ROOF SYSTEM

Roof panels shall the following type:

A. Standing seam roof system [**Identified on Drawings as RP-1**]

1. Rollformed profile shall be BigbeeLok-324 as manufactured by Bigbee Steel Buildings, Inc. Panels shall have an interlocking seam 3" deep spaced at 24" on center, with minor ribs between major ribs. Each panel shall provide a net coverage width of 24".
2. High ribs shall be have factory applied seam sealant.
3. Panels shall be manufactured from 24 gauge , 50,000 PSI material.
4. The BigbeeLok-324 roof system shall have concealed clips. Clips shall be floating (sliding) to allow for thermal movement, when required by design.
5. Panels shall be one piece for slope lengths less than 50'-0". The panel endlap, if required, shall have tape sealer sandwiched between the top and bottom panel with a rigid metal backer plate.
6. Panels shall be reversible end for end and no field notching shall be required.
7. Panel substrate finish shall be Galvalume® AZ50 coating in accordance with ASTM A792. Sheets shall be coated with a fluoropolymer topcoat containing not less than 70% polyvinylidene fluoride (PVDF) over primer with total DFT of 0.8 – 1.0. The reverse side shall be coated with pigmented polyester. Exterior color to be selected from Bigbee Steel Buildings, Inc. standard color choices.

2.03 MATERIALS – WALL SYSTEMS

A. Exterior wall panel [**Identified on Drawings as WP-1 (opaque), and WP-2 (translucent)**].

1. Rollformed profile shall be BigbeeRib II configuration as manufactured by Bigbee Steel Buildings, Inc. Panels shall have 1 1/4" deep major ribs spaced at 12" on center, with minor ribs between major

Equipment Storage Building

ribs. Each panel shall provide a net coverage width of 36".

2. Manufactured from 24 gauge, 80,000 PSI material.

3. Substrate shall be Galvalume® AZ50 coating in accordance with ASTM A792.

4. Sheets shall be coated with a fluoropolymer topcoat containing not less than 70% polyvinylidene fluoride (PVDF) over primer with total DFT of 0.8 – 1.0. The reverse side shall be coated with pigmented polyester. Exterior color to be selected from Bigbee Steel Buildings, Inc. standard color choices.

5. Panels shall be one piece from base to eave for lengths less than 35'-9". Endlaps, if required, shall be 6" and occur at a girt.

B. Liner panel shall be 26 gauge with a white polyester finish, rollformed to Bigbee's standard BigbeeRib II profile. Install in locations designated on the Contract Drawings. **[Identified on Drawings as WP-3]**

2.04 MATERIALS – SOFFIT

A. Soffit Panel, if required, shall be 26 gauge pre finished in paint color as selected by Architect from Manufacturer's standard color selections, rollformed to Bigbee's standard BigbeeRib II profile.

2.05 MATERIALS – TRIM

A. Trim shall be 26 gauge with a fluoropolymer topcoat containing not less than 70% polyvinylidene fluoride (PVDF) typical to wall panels. Color to be selected from Bigbee's full range of standard colors.

B. Provide trim at all corners of the building and for all sides of framed openings.

C. Downspouts shall be 26 gauge with a fluoropolymer finish and shall have a minimum cross sectional area of 15 square inches. Downspouts shall terminate above grade with an elbow at approximately 75°.

2.06 INSULATION

A. Roof and wall insulation shall be fiberglass rolls with 0.6 lb. per cu. ft. density, thickness as indicated on drawings, with a flame spread rating of 25 or less in accordance with ASTM E84. Insulation shall comply with NAIMA 202 Standards.

B. Insulation accessories include Manufacturer provided retainer straps at areas where insulation is secured to girt adjacent to air space.

2.07 METAL PERSONNEL DOORS AND FRAMES

A. Provide personnel doors and frame, knocked down for field assembly, as follows:

1. Frames shall be fabricated from 16 gauge galvanized steel, 5 3/4" depth, non-handed and reversible, with weather stripping.

2. Doors shall be manufactured from 18 gauge galvanized steel, 1-3/4" thick, full flush.

3. Lock edge shall be square with vertical seam mechanically interlocked and have 12 gauge reinforcement for strike preparation.

4. Hinge edge shall be square with vertical seam mechanically interlocked and have 7 gauge reinforcing plates at 3 locations with hinge preparations.

5. Doors shall have 16 gauge steel, flush-mounted, top channel and inverted bottom channel.

6. Doors shall be prepared for cylindrical lockset (2-3/4" backset)

7. Door core shall be a rigid cell, foamed-in-place polyurethane with 1.8 lbs. per cubic foot density.

Insulation core shall be chemically bonded to all interior surfaces, completely seal unit and produce total

surface support.

8. Not Used

9. Paint finish in colors as selected by Architect.

10. Reference Drawings for Door Schedule and Specifications Section 08 71 00 Hardware and Section 28 13 00 Access Control for hardware requirements.

2.08 NOT USED

2.09 TRANSLUCENT PANELS

A. Provide translucent wall panels matching the BigbeeRib II panel configuration.

1. Translucent panels shall be in color as selected by Architect from Manufacturer's standard color selections and have a nominal weight of 8 oz. per square foot with 55% light transmission as per ASTM D 1494.

2.10 ACCESSORIES

A. Fasteners to be manufacturers standard long life fasteners. Exposed fastener heads to be factory painted to match the panel color. Self-drilling fasteners shall be used for panel to structural connections. Lapteks shall be used for panel to panel connections. Pop rivets shall be used at endlaps of eave and gable trims.

B. Closed cell foam closure strips, die cut to match CS, AP, or LTC panel configuration. Metal closures shall be used with STC or MSC panel.

C. Mastic for roof sidelaps, endlaps, and flashings to be a non-hardening butyl tape, non-corrosive to the substrate, of 100% solids. Tape size to be minimum 3/32" x 3/4", supplied in rolls.

D. Caulk shall be manufacturers standard product as appropriate for the application.

E. Thermal blocks of expanded polystyrene shall be supplied with standing seam roof systems when required for the requested insulation thickness. The thickness of the thermal block shall be compatible with the clip height and insulation thickness.

F. Louvers shall be 3' x 3' self-framing and self-flashing units with insect screen. Louver frame to be minimum 18 gauge galvanized and blades to be minimum 20 gauge galvanized. Finish to be electrostatically applied polyester paint. Operator to be either hand crank or chain operator.

G. Continuous gravity ventilators shall have 9" or 12" throat, supplied in 10' lengths, with birdscreen. Ventilators to be of low profile design to provide gravity type ventilation. Include flashing for either single unit or continuous-run installation. 9" x 10' unit shall have a base ventilating capacity of 2700 and the 12" x 10' unit shall have a base ventilating capacity of 3600 CFM, assuming 10 degree temperature differential and 5 mph wind speed. Exterior parts to be minimum 26 gauge in Galvalume painted galvanized. Interior parts to be G90 galvanized.

H. Roof curbs shall be used at all roof penetrations except pipes 13" diameter and less. Roof curb shall have a structural subframe. Curb and subframe shall be designed to support the weight of the unit. Curb shall be designed specifically for the model number of the roof top unit. Curb shall be supplied with rib covers and all necessary fasteners and mastic for a weathertight installation. The roof curb shall be a two piece floating curb when required by building conditions.

I. Roof Jacks shall be used at all 13" diameter and less pipes that penetrate the roof. Roof jacks shall be EPDM with a flexible aluminum base to form a weathertight seal at the roof panel.

2.11 FABRICATION

Equipment Storage Building

- A. Fabricate built-up members in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.
- B. Fabricate hot rolled members in accordance with AISC Specification for pipe, tube, and rolled structural shapes.
- C. Fabricate cold formed members in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.
- D. Provide factory drilled or punched framing members for field bolted connections.
- E. All framing members shall be prepared according to SSPC-SP2 and given one shop coat of standard red oxide primer.
- F. Clearly and legibly mark each piece to correspond with previously prepared erection drawings.

PART 3 EXECUTION

3.01 ERECTION – FRAMING

- A. Erect framing in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.
- B. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads, such as wind loads acting on the exposed framing and seismic forces, as well as loads due to erection equipment and erection operation, but not including loads resulting from the performance of work by others. Bracing furnished by the manufacturer for the metal building system cannot be assumed to be adequate during erection. The temporary guys, braces, falseworks and cribbing are the property of the erector, and the erector shall remove them immediately upon completion of erection.
- C. Do not field cut or alter structural members without approval of the metal building manufacturer.
- D. After erection, prime welds, abrasions, and surfaces not shop primed.

3.02 ERECTION – WALL AND ROOFING SYSTEM

- A. Install in accordance with manufacturer's instructions.
- B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.

3.03 ERECTION – GUTTER AND DOWNSPOUTS

- A. Install gutters and downspouts in strict accordance with manufacturer's instructions.
- B. Connect downspouts to storm sewer system or install splash pans.
- C. Paint colors as selected by Architect from Manufacturer's standard color selections.

3.04 INSTALLATION - ACCESSORIES

- A. Install accessories in accordance with manufacturer's instructions.
- B. Seal wall and roof accessories weathertight.

Galvalume® is a registered trademark of BIEC International, Inc.

END OF SECTION

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Supports and anchorages.
8. Identification

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 MAINTENANCE LOG

A. The contractor shall maintain an appropriate maintenance log, where applicable, of all interim maintenance tasks performed on all equipment started-up and/or operated during construction so that the manufacturer's warranties are not voided prior to the equipment being turned over to the owner. Maintenance logs shall be submitted to the owner as a part of the project close-out documentation when the building is released to the owner.

1.6 COORDINATION DRAWINGS

A. The submission of coordination drawings shall be required prior to any equipment/systems installation to ensure that installation conflicts between trades are minimized.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, **1/8-inch** maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig a minimum working pressure at 180 deg F.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig or minimum working pressure as required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Stainless steel, Include two for each sealing element.
- D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated
2. Finish: Polished chrome-plated

2.7 IDENTIFICATION TAGS AND MARKERS FOR PLUMBING

- A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with 3/4" tall engraved black letters on light contrasting background color.
- C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
- E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings indicating service and direction of flow (if applicable).
- F. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.
- G. Identify the following piping systems:
 1. Domestic Cold Water.
 2. Domestic Hot Water.
 3. Sanitary Waste and Vent.
 4. A/C Condensate.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.

- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Section 07 84 00 - Firestopping for materials.
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements. Provide clearances to equipment as required in manufacturer's literature.
- S. All piping penetrations of floors, wall, partitions, etc. shall be caulked / sealed full perimeter - regardless of whether or not the wall / partitions is fire rated.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 3. PVC Nonpressure Piping: Join according to ASTM D 2855.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2" and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2" and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.6 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Cure placed grout.

3.7 PLUMBING IDENTIFICATION DEVICES

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.
- B. Plastic Tags: Install with corrosive-resistant chain.

- C. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- D. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
- E. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.
- F. Equipment: water heaters, pumps etc. and associated starters with engraved nameplates. Match the record drawings.
- G. Valves: Identify valves in main and branch piping with tags.
- H. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Omit only in areas where piping is run exposed to view in finished spaces as determined by the architect. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

3.8 PROTECTION OF WORK

- A. The contractor must take appropriate precautions during construction to prevent dust and debris from entering water systems by covering equipment and open-ended pipes as the installation progresses.

3.9 PRESSURE TEST

- A. The results of all piping system pressure test shall be submitted to the construction manager for record purposes.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe, duct, and equipment hangers, supports, and associated anchors.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.
- E. Place hanger and support inserts and sleeves.
- F. Through-penetration firestopping.

1.2 RELATED WORK

- A. Section 22 07 00 - Plumbing Insulation.
- B. Section 22 11 16 - Domestic Water Piping.
- C. Section 22 11 19 - Domestic Water Piping Specialties.
- D. Section 22 13 16 - Sanitary Waste and Vent Piping.

1.3 REFERENCES

- A. ANSI/ASME B31.1 - Power Piping
- B. U.L. Fire Resistant Directory. Through Penetration Fire Stop Systems for walls, floors, and partitions.

1.4 SUBMITTALS

- A. Reference Section 01 33 00 - Shop Drawings, Product Data, Samples.
- B. Submit shop drawings and product data.
- C. Indicate hanger and support framing and attachment methods.
- D. Indicate U.L. system number for all Penetration Systems thru fire rated walls or partitions.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 to 4 inches and Cold Pipe Sizes 6 inches and over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.

- G. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- H. Floor Support for Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support. Grinnell Figure 264 or equal.
- I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support. Grinnell Figure 274 or equal.
- J. Shield for Insulated Piping 2-1/2 Inches and Smaller: Finish insulation with vapor barrier mastic. Provide 14 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support. Grinnell Figure 167 or equal. Provide shields for all piping, including piping supported or roller hangers.
- K. Shields for Insulated Piping 3 Inches and Larger: Provide foamglass insulation section, 18 inch minimum length, shield thickness same as insulation thickness. Provide 14 gage galvanized sheet shield over insulation in 180 degree segments, minimum 18 inches long at pipe support.
- L. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.2 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.3 INSERTS

- A. Inserts: Malleable iron case of (galvanized) steel and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.
- B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with schedule 40 steel pipe.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Schedule 40 steel with U.L. listed fire barrier caulk per the requirements of the U.L. Fire Resistance Directory Fire Stop System.
- D. Stuffing or Fire Stopping Insulation: As required by the applicable U.L. System for Through Penetration Fire Stop System.
- E. Caulk: Per applicable U.L. Through Penetration Fire Stop Systems.
- F. Wrap for insulated piping penetrations of rated walls and floors: Elastomeric intumescent wrap strip per U.L. Fire Resistance Directory - through Penetration Fire Stop Systems.

2.5 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Provide copper plated hangers and supports for un-insulated copper piping.

2.6 FINISH

- A. Prime coat all steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are included.
- B. Provide one (1) prime coat and one (1) finish coat of paint on all exterior or interior exposed steel hangers and supports.

2.7 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

- A. Systems or devices listed in the U.L. Resistance Directory under categories XHCR and XHEZ shall be used to protect all mechanical piping or conduit (temperature controls) penetrations of fire rated construction, the system used shall conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance. Systems or devices must be asbestos-free.
- B. The systems withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.
- C. Acceptable manufacturers and products shall be those listed in the U.L. Fire Resistance Directory for the U.L. System involved.
- D. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.
- E. Forming materials: As classified under category XHKU in the U.L. Fire Resistance Directory.

PART 3 - EXECUTION

3.1 INSERTS

- A. Where concrete slabs form finished ceiling, provide inserts to be flush.

3.2 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as follows:

PIPE SIZE	MAX.HANGER SPACING	HANGER DIAMETER
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inches	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
C.I. Bell and Spigot (or No-Hub) and at all joints	5'-0"	5/8"
PVC	4'-0"	3/8"

- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- C. Place a hanger within **12 inches of each horizontal elbow.**
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Size supports large enough to allow for insulation covering. Insulation for all piping shall be continuous at all supports.

3.3 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads for all floor mounted equipment. Pads shall be minimum 6" tall and shall be reinforced as called for on the structural drawings. Pads shall be 6" larger than the equipment on all sides. Chamfer edges.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct support of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.
- E. Grout pump bases per the pump manufacturer's recommendations.
- F. Provide seismic anchors for all mechanical equipment and associated supports.

3.4 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

- B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into pipe, 8 inches minimum clear on sides with 36 x 36 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal. EPDM Roof: Flash per roof manufacturer's recommendation.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- D. Seal Floor and mop sink drains watertight to adjacent materials.
- E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

3.5 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

3.6 SEISMIC BRACING

- A. Provide seismic restraints in accordance with the requirements of the 1999 Standard Building Code for the following:
 - 1. All natural gas piping.
 - 2. All other piping in Mechanical Equipment Rooms 1-1/4" diameter and larger, all piping (other than gas) outside Mechanical Equipment Rooms 2-1/2" diameter and larger and all conduits 2-1/2" diameter and larger.Exception: Piping suspended by individual hangers 12 inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced.
- B. Where possible, hangers and supports for pipes shall not exceed a length of 12 inches.
- C. Coordinate bracing methods with vibration isolation systems. Use cable restraints, in accordance with S.M.A.C.N.A. Restraint Manual, to prevent short circuiting vibration isolation devices.
- D. Anchor and secure all devices, equipment, tanks, panels, etc. to resist seismic forces.
- E. Submittal Data Requirements
 - 1. The manufacturer of vibration isolation and seismic restraints shall provide submittals for products as follows:
 - a. Descriptive Data:
 - 1) Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
 - 2) Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.
 - b. Shop Drawings:
 - 1) Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
 - 2) Provide all details of suspension and support for ceiling hung equipment.

- 3) Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.
- 4) Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.

c. Seismic Certification and Analysis:

- 1) Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.
- 2) All restraining devices shall have a preapproval number from California OSHPD or some other recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45° to the weakest mode.
- 3) Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the code required seismic forces acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

END OF SECTION

SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Piping Insulation.
- B. Jackets and accessories.

1.2 RELATED WORK

- A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
- B. Section 22 11 16 - Domestic Water Piping.
- C. Section 22 13 16 - Sanitary Waste and Vent Piping.

1.3 REFERENCES

- A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- B. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- C. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.
- D. ASTM E84 - Surface Burning Characteristics of Building Materials.

1.4 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping insulation application with documented experience.
- B. Materials: Flame spread/fuel contributed/smoke developed rating of 25/30/50 in accordance with ASTM E84.
- C. Systems: Insulation systems at penetrations of fire rated construction shall be as required by the U.L. Fire Resistance Directory.

1.5 SUBMITTALS

- A. Submit product data.
- B. Include brochure and description list of materials and thickness for each service and locations.
- C. Submit manufacturer's installation data.

PART 2 - PRODUCTS

2.1 INSULATION

- A. Type A: Glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75 degrees F; noncombustible as manufactured by Owens-Corning.
- B. Type B: Tubular closed cell insulation; "K" value of 0.255 at 75 degrees F. equal to Halstead.
 - 1. Joint Sealant: Closed cell elastomeric tape, 1/8" x 2" wide.
 - 2. Exterior Sealant: Synthetic resin protective paint.

3. Pre-slit insulation is not acceptable.

2.2 JACKETS AND FITTINGS

- A. Kraft reinforced all service jacketing (ASJ) shall be standard on all piping.
- B. Aluminum jacketing with aluminum fittings for elbows, etc. as called for.
- C. All aluminum jacketing shall be 0.016" thick smooth. Corrugated aluminum jackets are not acceptable.

2.3 ACCESSORIES

- A. Insulation Bands: 3/4 inch wide; stainless steel or 0.007 inch thick.
- B. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.
- C. Finishing Cement: ASTM C449.
- D. Fibrous Glass Cloth: Untreated; 9 oz/sq yd weight.
- E. Adhesives: As directed by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install materials after piping has been tested and approved.

3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Insulation with vapor barrier through supports and penetrations shall be continuous.
- C. In exposed piping, locate insulation and cover seams in least visible locations.
- D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. On insulated hot water piping: neatly bevel and seal at unions, valves and flow controllers. Seal with manufacturers approved finishing material.
- F. Neatly cutout and seal insulation at all cleanouts in drain piping. Seal to maintain insulation system vapor barrier.
- G. Provide an insert, (See Supports Section 22 05 29) of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be foamglass or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.
- H. Neatly finish insulation at supports, protrusions, and interruptions.

I. Insulation for all cold water piping shall have vapor barrier jackets, factory-applied. Insulate cold water and make-up water fittings, joints and valves with pre-molded insulation of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive. All insulation at pipe fittings shall be factory pre-molded type.

J. Domestic hot water piping fittings and joints shall be insulated with material and thickness as adjacent piping and finished with PVC covers. Neatly bevel and seal hot water pipe insulation at pumps, unions, valves, etc.

K. All rainleader (roof drain) piping shall be insulated; this includes primary lines, emergency overflow lines, horizontal and vertical piping. Insulation shall be continuous through hangers and supports.

L. Jackets:

1. Indoor, Concealed Applications: Insulated pipes conveying fluids *above* ambient temperature shall have standard all service jackets, with or without vapor barrier, factory-applied or field-applied.

Insulate fittings and joints with factory pre-molded insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. No exceptions. Neatly bevel and seal insulation at valves. PVC fitting covers may be used over pre-molded fitting insulation. PVC elbow covers with fiberglass insulation stuffing **shall not** be used.

2. Indoor, Concealed Applications: Insulated pipes conveying fluids *below* ambient temperature shall have vapor barrier jackets, factory-applied. **Insulate fittings, joints, and valves with factory pre-molded insulation of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive.** PVC jackets are **not** acceptable.

3. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications and provide aluminum jacket for all piping, valves, and fittings.

4. Provide 0.016" smooth aluminum jacket for all type "A" pipe insulation located outside the building and all piping in the mechanical rooms within 6'- 0" of the floor.

5. All exterior exposed portions of closed cell foam (Type "B") insulation shall be protected with minimum 2 coats weatherproof synthetic resin sealant.

6. Insulation with vapor barrier jacket shall not be installed using staples unless same is protected by mastic being applied over staples.

3.3 SCHEDULE

PIPING	TYPE	PIPE SIZE	INSULATION THICKNESS INCH
Domestic Hot Water Supply	A	All	1"
Domestic Cold Water	A	All	1/2"
Condensate Drains	A	All	1/2"

Note: Insulation types, thicknesses, density, etc. at penetrations of fire rated construction shall be as required by the U.L. Fire Resistance Directory.

END OF SECTION

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe and pipe fittings.
- B. Valves.
- C. Domestic water piping system.

1.2 RELATED WORK

- A. Section 31 22 00 - Structure excavation, backfill and finished grading.
- B. Section 09 90 00 - Painting.
- C. Section 22 05 00 - Common Work Results for Plumbing.
- D. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
- E. Section 22 07 00 - Plumbing Insulation.
- F. Section 22 11 19 - Domestic Water Piping Specialties.
- G. Section 22 40 00 - Plumbing Fixtures.

1.3 REFERENCES

- A. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- B. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.
- D. ANSI/ASTM B32 - Solder Metal.
- E. ANSI/ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- F. ANSI/AWS D1.1 - Structural Welding Code.
- G. ASTM B88 - Seamless Copper Water Tube.

1.4 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME Sec. 9, and ANSI/AWS D1.1.

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.
- B. Include data on pipe materials, pipe fittings, valves and accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.1 WATER PIPING, BURIED BELOW CONCRETE SLABS OR PAVED AREAS

- A. Copper Tubing: ASTM B88, Type K, hard drawn.
 - 1. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper.
 - 2. Joints: ANSI/ASTM B32.

2.2 WATER PIPING, ABOVE GRADE, 2-1/2" AND SMALLER

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper.
 - 2. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.3 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under:
 - 1. Ferrous pipe: 150 psig malleable iron threaded unions.
 - 2. Copper tube and pipe: 150 psig bronze unions with soldered joints.
- B. Pipe Size Over 2 Inches:
 - 1. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
 - 2. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
 - 1. Housing: Malleable Iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 2. Sealing gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.4 BALL VALVES

- A. 2 Inch and Under:
 - Equal to Watts LFB6080 1/4" thru 2", Watts #G-4000-FDA 2-1/2" and larger.
- B. Valves shall have stainless steel ball, full port, and extended handle.

2.5 SWING CHECK VALVES

A. Manufacturers:

1. Watts LFCV or approved equal, 90° or 45°, FDA approved rated at 200 PSI WOG.

B. Up to and including 2 Inches: Bronze swing disc, solder or screwed ends.

C. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

2.6 RELIEF VALVES

A. Manufacturers:

1. Watts LF100XL or approved equal.

B. Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities AGA and ASME certified and labeled.

2.7 STRAINERS

A. Watts or equal FDA approved “Y” Type, rated 200 PSI WOG.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavations under provisions of Section 31 22 00.

B. Verify that excavations are to required grade, dry, and not over-excavated.

C. Verify the copper tubing and fittings are free of defects, sand holes, or cracks.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe. Copper tubing shall be cut with a wheeled tubing cutter.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals and where pipe extends into grade.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.
- H. Slope water piping and arrange to drain at low points.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 22 05 00.
- K. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum unless otherwise noted. Maintain gradients.
- L. Install in accordance with manufacturer's instructions.
- M. Establish elevations of buried piping outside the building to ensure not less than one foot of cover.
- N. Provide support for utility meters in accordance with requirements of utility companies.
- O. Excavate in accordance with Section 31 22 00 for work of this section.
- P. Backfill in accordance with Section 31 22 00 for work of this section.
- Q. Install valves with stems upright or horizontal, not inverted.

3.4 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install ball valves for throttling, bypass, or manual flow control services.
- E. Provide spring loaded check valves on discharge of water pumps.
- F. Use grooved mechanical couplings and fasteners only in accessible locations.
- G. All valves, supplies, and pipe accessories installed in the domestic water system shall be certified by the manufacturer to meet lead-free requirements.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C601.
- I. Provide documentation from local health department denoting approval of potable water system prior to owner occupying building. No Exceptions!

END OF SECTION

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Water hammer arrestors.
- B. Hose bibbs.
- C. Hydrants.
- D. Backflow preventers.

1.2 RELATED WORK

- A. Section 22 11 16 - Domestic Water Piping.

1.3 REFERENCES

- A. ANSI A112.26.1 - Water Hammer Arresters.
- B. PDI WH-201 - Water Hammer Arresters.
- C. ANSI / ASSE 1011 - Hose Connection Vacuum Breakers.
- D. ANSI / ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

1.4 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01 78 21.
- B. Record actual locations of equipment, backflow preventers, and concealed valves.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01 78 21.
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.
- B. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 - PRODUCTS

2.1 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Watts LF15M2 or equal.
2. Provide water hammer arrestors on all equipment served by quick action solenoid valves.

B. ASSE 1010 and ANSI A112.26.1; sized in accordance with PDI WH-201.

2.2 HOSE BIBBS/HYDRANTS

A. ANSI/ASSE 1019; non-freeze, removable key, and vacuum breaker; as indicated on the drawing.

B. Approved manufacturers: Zurn, Watts, and Woodford.

C. All hose bibbs shall be certified as lead-free by the manufacturer.

2.3 REDUCED PRESSURE BACKFLOW PREVENTERS

A. Manufacturers: Watts, Zurn, Wilkins.

1. Watts Series 957, 919 or approved equal with bronze strainer and quarter turn ball valves, FDA approved, ASSE No. 1013, AWWA C511-92, CSA B64.5, UL Classified File No. EX3185, IAPMO PS 31, SBCCI.

2. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel, or directly into the supply pipe via a separate vent. The assembly shall include two tightly closing shutoff valves before and after the assembly, test cocks and a protective strainer upstream of the No. 1 shutoff valve.

3. All backflow preventers shall be certified by a cross connection control device tester.

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATIONS

A. Install specialties in accordance with manufacturer's instructions to permit intended performance. Where applicable, consult the manufacturer's technical representative for assistance and review of installation for appropriate function.

B. Install water hammer arrestors complete with accessible isolation valve on hot and cold water piping as recommended by Wade "Sizing and Placement Data". Provide access doors in accordance with Section 08 31 00.

END OF SECTION

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe and pipe fittings.
- B. Valves.
- C. Sanitary sewer piping system.
- D. Rainleader Piping.

1.2 RELATED WORK

- A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
- B. Section 22 13 19 - Sanitary Waste Piping Specialties.

1.3 REFERENCES

- A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- B. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- D. ANSI/ASME Section 9 - Welding and Brazing Qualifications.
- E. ANSI/ASTM B32 - Solder Metal
- F. ANSI/AWS D1.1 - Structural Welding Code.
- G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- H. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- I. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated Galvanized), Welded and Seamless, for Ordinary Uses.
- J. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- K. ASTM B306 - Copper Drainage Tube (DWV).
- L. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- M. AWS A5.8 - Brazing Filler Metal.
- N. AWWA C601 - Standard Methods for the Examination of Water and Waste Water.

O. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

1.4 QUALITY ASSURANCE

- A. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- B. Welders Certification: In accordance with ANSI/ASME Sec. 9, and ANSI/AWS D1.1.

1.5 SUBMITTALS

- A. Include data on pipe materials, pipe fittings, valves and accessories.

1.6 DELIVERY, STORAGE, AND HANDING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED

- A. Cast Iron Pipe: ASTM 74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Pre-molded neoprene compression gasketing system.
- B. All pipe and fittings shall be marked with collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.
- C. PVC Pipe: ASTM D2665, D1785, Schedule 40.
 - 1. Fittings: PVC.
 - 2. Joints: ASTM D2885, solvent weld with ASTM D2564 solvent cement.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron, CISPI 301.
 - 2. Joints: Heavy duty shielded 4 band type couplings meeting CISPI 301 with stainless steel shield and neoprene gasket.
 - 3. All pipe and fittings shall be marked with collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.
 - 4. Install cast iron pipe in return air plenums.
- B. PVC Pipe: ASTM D2665, D1785, Schedule 40.

1. Fittings: PVC.
2. Joints: ASTM D2885, solvent weld with ASTM D2564 solvent cement.

2.3 EQUIPMENT DRAINS AND OVERFLOWS (CONDENSATE)

- A. Copper Tubing: Seamless copper drainage tube (DWV), Minimum 1 1/4" size.
1. Fittings: ANSI/ASME B16.23 Cast brass, or ANSI/ASME B16.29 solder wrought copper with wye and brass cleanout plug at all changes in direction.
 2. Joints: soldered joints, using lead-free solder complying with ASTM B32.
 3. Traps: Factory fabricated, deep seal type, mechanical joint.
 4. Install copper pipe in return air plenums.
- B. PVC Pipe: ASTM D2665, C1785, Schedule 40.
1. Fittings: PVC.
 2. Joints: ASTM D2885, solvent weld with ASTM D2564 solvent cement.
 3. Traps: Deep seal type.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe. Remove scale and dirt, on inside and outside, before assembly.

3.2 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals and where pipe extends into grade.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- G. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- H. Install bell and spigot pipe with bell end upstream.
- I. Group piping whenever practical at common elevations.
- J. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 22 05 00.

- K. Install in accordance with manufacturer's instructions.
- L. Establish elevations of buried piping outside the building to ensure not less than one foot of cover.
- M. Excavate in accordance with Section 31 22 00 for work of this section.
- N. Backfill in accordance with Section 31 22 00 for work of this section.

3.3 SERVICE CONNECTIONS

- A. Connect to existing sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Field verify exact size, depth and location of all utilities prior to construction.

END OF SECTION

SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Floor drains
- B. Cleanouts.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 01 10 00 - Summary of Work: Owner furnished equipment.

1.3 RELATED WORK

- A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
- B. Section 22 11 16 - Domestic Water Piping.
- C. Section 22 40 00 - Plumbing Fixtures.

1.4 REFERENCES

- A. ANSI/A112.21.1 - Floor Drains.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01 78 21.
- B. Record actual locations of equipment, cleanouts, backflow preventers and concealed valves.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01 78 21.
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.
- B. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

- A. ANSI A112.21.1; Model type and manufactured as indicated on drawings.
- B. Approved manufacturers: Zurn, Watts, Wade.

2.2 CLEANOUTS

- A. Clean-outs shall be provided in waste and drainage lines where indicated on drawings and/or required by Plumbing Code. Cleanouts shall be sized same as for pipe in which installed, except no clean-out need be larger than 4" in diameter.
- B. Where installed in exposed cast iron pipe, cleanouts shall consist of raised-head cast brass plug with caulking ferrule.
- C. Cleanouts in walls shall consist of raised head, cast brass plug with stainless steel cover.
- D. Where installed in floors, cleanouts shall consist of cast iron ferrule, brass plug, adjustable cast iron housing and nickel brass serrated cover and matching flange for flush mounting. Cleanouts in carpeted areas shall be provided with carpet marker. Outside cleanouts shall be set in a 12" x 12" x 6" thick concrete pad, top of pad shall be flush with finish grade.
- E. Approved manufacturers: Zurn, Watts, Wade.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate cutting and forming of floor construction to receive drains to required invert elevations.

3.2 INSTALLATION AND APPLICATIONS

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in 2 foot square x 4" thick concrete pad flush with grade, with 1/4 inch clearance between cleanout and pad.

END OF SECTION

SECTION 22 33 00
ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This Section includes the following:
1. Light-commercial electric water heaters.
 2. Water heater accessories.

1.2 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.
- D. Warranty.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 2. Warranty Period(s): From date of Substantial Completion:
 - a. Commercial Electric Water Heaters: Five years.

PART 2 - PRODUCTS

2.1 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS

- A. Description: Comply with UL 174 for household, storage electric water heaters.
- B. Water heaters shall be as scheduled on the plans or approved equivalent.
- C. Pressure Rating: 150 psig.

D. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

E. Factory-Installed Storage-Tank Appurtenances:

1. Anode Rod: Replaceable magnesium.
2. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
3. Drain Valve: ASSE 1005.
4. Insulation: Comply with ASHRAE/IESNA 90.1 or ASHRAE 90.2.
5. Jacket: Steel with enameled finish.
6. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
7. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
8. Temperature Control: Adjustable thermostat for each element.
9. Safety Control: High-temperature-limit cutoff device or system.
10. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

F. Approved Manufacturers: A.O. Smith, State, Lochinvar, Bradford White.

2.2 WATER HEATER ACCESSORIES

A. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor or wall mounting and capable of supporting water heater and water.

B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.

2.3 CIRCULATION PUMP

A. Approved Manufacturers: Grundfos.

B. As scheduled on drawings, suitable for 125 working pressure with:

1. Mechanical shaft seal.
2. 115 V, single phase motor with thermal overload protection.
3. Flexible shaft coupling.

C. Provide Honeywell L4006 series aquastat set to stop pump motor when return line water temperature is 115°F and to start pump when return water temperatures drops to 105°F.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.

1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
2. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.

E. Install thermometer on outlet piping of water heaters.

F. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.

G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

H. Fill water heaters with water.

I. Power wiring shall be done by the electrical contractor.

3.2 CONNECTIONS

A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections.

B. Perform the following field tests and inspections:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Plumbing fixtures.

1.2 RELATED WORK

- A. Section 06 41 00 - Architectural Casework.
- B. Section 07 90 05 - Joint Sealers.
- C. Section 10 28 00 - Toilet and Bath Accessories.
- D. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
- E. Section 22 11 16 - Domestic Water Piping.
- F. Section 22 11 19 - Domestic Water Piping Specialties.
- G. Section 22 13 16 - Sanitary Waste and Vent Piping.
- H. Section 22 13 19 - Sanitary Waste Piping Specialties.
- I. Section 22 34 00 - Fuel Fired Domestic Water Heaters.

1.3 REFERENCES

- A. ANSI/ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public use.
- B. ANSI/ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- C. ANSI/ASME A112.19.1 - Enameled Cast Iron Plumbing Fixtures.
- D. ANSI/ASME A112.19.2 - Vitreous China Plumbing Fixtures.
- E. ANSI/ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
- F. ANSI/ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- G. ANSI/ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.

1.4 QUALITY ASSURANCE

- A. Fixtures: By same manufacturer for each product specified throughout.
- B. Trim: By same manufacturer for each product specified throughout.

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01 78 21.
- B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.
- B. Accept fixtures on site in factory packaging. Inspect for damage.
- C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- B. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories and sinks.

1.9 WARRANTY

- A. Provide five year manufacturer's warranty under provisions of Section 01 77 70.
- B. Warranty: Include coverage of electric water cooler compressor.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

- A. Plumbing fixtures shall be equal to type and manufacturer scheduled on the drawings.
- B. Approved manufacturers:
 - 1. Faucets: Kohler, American Standard, Delta, Chicago, Elkay, Kohler.
 - 2. Sinks: Elkay, Just.
 - 3. Mop Sinks: Stern Williams, Fiat.
 - 4. Traps and Supplies: Kohler, Zurn, McGuire, T&S Brass.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings **before** rough-in and installation.
- B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.2 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.

3.3 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.4 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install each fixture with mechanical joint trap, easily removable for servicing and cleaning.
- C. Provide chrome plated rigid supplies to fixtures with stops, reducers, and escutcheons.
- D. Install components level and plumb.
- E. Install and secure fixtures in place with wall supports, wall carriers, and bolts as indicated.
- F. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.
- G. Cover all floor drains during construction to prevent construction debris from entering the plumbing system.
- H. Cap all plumbing waste outlets during construction until fixtures are installed.
- I. Mount fixtures to heights as indicated on the drawings.
- J. Brass nipples shall be used for wall hung urinal waste outlets. "No Substitute".
- K. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.6 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.7 CLEANING

- A. At completion clean plumbing fixtures and equipment.

3.8 PROTECTION OF FINISHED WORK

- A. Protect all finished work. Replace all damaged fixtures.

3.9 FIXTURE HEIGHTS

- A. Fixtures shall be mounted at heights as indicated on the architectural drawings.

3.10 FIXTURE TRAPS

- A. P-traps serving public plumbing fixtures shall meet ASME / ANSI A112.18.1M or IAPMO / UPC requirements. P-traps shall be cast brass construction with adjustable rotation on tube outlet, slip-point inlet, and cleanout plug. The inlet and outlet shall be 1-1/2" O.D.
- B. Offset drains serving public plumbing fixture shall meet ASME / ANSI A112.18.1M or IAPMO / UPC requirements. The drain is intended for lavatory installations shall be brass construction with grid drain, 6" offset, and 1-1/4" connection.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
 2. Dielectric fittings.
 3. Mechanical sleeve seals.
 4. Sleeves.
 5. Escutcheons.
 6. Sealing of penetrations.
 7. Equipment installation requirements common to equipment sections.
 8. Concrete bases.
 9. Supports and anchorages.
 10. Mechanical Identification

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

- C. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
- D. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- E. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 COORDINATION

- A. For purposes of clearness and legibility, drawings are essentially diagrammatic, and, although size and location of equipment are drawn to scale wherever possible, the contractor shall make use of all data in all of the contract documents and shall verify this information at the building site. **THE DESIGN DRAWINGS ARE NOT INTENDED AS SHOP DRAWINGS AND THE CONTRACTOR SHALL VERIFY ALL SPACE REQUIREMENTS AND CLEARANCES FOR THE INSTALLATION OF THE MECHANICAL WORK WITH THE WORK OF ALL OTHER TRADES AND EXISTING CONDITIONS PRIOR TO BEGINNING ANY DUCT OR PIPE FABRICATION OR INSTALLATION.** Failure to properly coordinate all work prior to installation shall result in the contractor correcting all misplaced work at no cost to the Owner.
- B. The drawings indicate required size and points of termination of pipes and ducts, and suggest proper routes of pipe to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets. Install piping and ducts in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear without further instruction or cost to the Owner.
- C. Shop drawings shall be furnished indicating all changes to meet space requirements, code requirements, and as necessary to resolve all space conflicts.
- D. It is intended that all apparatus be located symmetrical with architectural elements, and shall be installed at exact height and locations as shown on the architectural drawings.
- E. The Contractor shall fully inform himself regarding any and all peculiarities and limitations of the space available for the installation of all work and materials furnished and installed under the Contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible.
- F. It shall be the responsibility of the contractor to locate and mark all existing underground utilities on the existing site and serving the existing building. Coordinate all new utility work with the existing utilities so as to not disturb, damage or cut any existing utility services. Unless noted otherwise on the plans, all utilities serving the existing building are to remain in service throughout the construction of the new building. Any required interruptions in utilities must be coordinated with the owner/architect minimum 14 days in advance in writing to the architect.
- G. In doing all work under this Contract, the Contractor shall carefully protect all existing lines which are to be maintained in service or which are not to be changed from any damage or discoloration, and shall make good, at his own expense, any damage done to such lines. All existing utilities cut or damaged by the

contractor during the course of work for this project shall be promptly repaired in a manner satisfactory to the Architect, Owner, and governing authority (as applicable) at no cost to the owner.

H. In performing the work under this Contract, it is possible that the contractor may encounter unknown underground utility lines. Such line may be lines which have or will be abandoned, inactive lines which it may be desired to preserve for future use, or active lines which must be preserved and either relocated or replaced.

I. Should the Contractor encounter any such unknown lines, he shall at once notify the Architect, who will determine whether they have been or may be abandoned or shall be preserved. The Engineer shall determine the character of the lines and, in the case of lines to be preserved, how best to care for them.

J. If it is found desirable or necessary to preserve the lines, they shall be capped off, relocated or otherwise cared for as directed by the Architect. In general, they shall be done by the trade having jurisdiction, but all contractors shall fully cooperate in such work.

K. All pavements, sidewalks damaged incident to construction work under this Contract shall be replaced by the Contractor as soon as possible in a manner satisfactory to the Architect, Owner, and governing authority, if applicable.

L. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned, as directed by the manufacturers, unless herein specified to the contrary. Should there be a discrepancy between the installation shown on the drawings and/or specified and the manufacturers' directions and/or recommendations, this must be brought to the Architect's attention, and the procedure settled before proceeding with the work.

M. Contractor shall review each major unit of work to inspect the substrate to receive the work and conditions under which the work is to be performed. The installer shall report all unsatisfactory conditions in writing to the Architect. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

N. Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents.

O. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

P. Provide attachment and connection devices and methods for securing work. Secure work true to line and level, and within recognized industry tolerances. Allow for expansion and building movement. Provide uniform joint width in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable visual effect choices to the Architect for final decision.

Q. Recheck measurements and dimensions of the work, as an integral step of starting each installation.

R. Install each unit of work during weather conditions and project status which will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration. Take the necessary precautions to protect all installed work from ongoing construction and the work of other trades.

S. Coordinate enclosure of the work with required inspections and tests, so as to minimize the necessity of uncovering the work for that purpose.

T. Mounting Heights: Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. Refer questionable mounting height choices to the Architect for final decision.

U. During handling and installation of work at the project site, clean and protect work in progress and adjoining work at the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion.

V. Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.5 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

B. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing. Where large ceiling cavity space exist, locate all valves and specialties within 18 inches of the ceiling access opening.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor, roof slabs and where necessary to comply with U.L. at rated wall penetrations.
- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 8 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 8 inches and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

B. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

C. Install equipment to allow right of way for piping installed at required slope.

D. Install all equipment per manufacturer's recommendations.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to meet seismic requirements.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions. Seismic anchor bolts shall be used unless otherwise indicated.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.
- D. Do not install combustible materials in return air plenums.

3.8 SEALING OF PENETRATIONS

- A. All pipe and duct penetrations of walls, floors and partitions shall be sealed full perimeter to be completely "smoke tight"; regardless of whether or not the wall, floor or partition is rated. Pipe penetrations of fire rated construction shall be sealed as specified in Section 23 0529.

3.9 MECHANICAL IDENTIFICATION DEVICES

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.
- B. Plastic Tags: Install with corrosive-resistant chain.
- C. Stencil Painting (Ductwork only): Apply in accordance with Section 09 90 00.
- D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- E. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
- F. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.
- G. Equipment: fans, air handlers, condensing units, unit heaters, etc. and associated starters and disconnect switches with engraved nameplates. Match the record drawings.
- H. Controls: Identify control panels and major control components outside panels with engraved nameplates.
- I. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Omit only in areas where piping is run exposed to view in finished spaces as determined by the architect. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on

straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

J. Ductwork: Identify ductwork with plastic markers or stencil painting with minimum 1" tall letters. Identify air handling unit, or fan served as well as service (supply, return, exhaust, outside air, etc). Omit on exposed ductwork in finished spaces.

K. Identify all duct access panels with stencil lettering per NFPA 90A.

L. Identify all HVAC motor starters with engraved tags.

END OF SECTION

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

B. Motor Controllers.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.6 MOTOR CONTROLLERS

- A. It shall be the responsibility of this section to furnish all required starters and motor controllers for all mechanical devices. Starters shall be equipped with all accessory inputs necessary to accomplish the specified sequence of operations.
- B. Starters shall be mounted and wired by Division 16.
- C. Starters shall be weatherproof where required.

D. Manual Controllers

1. Manual Motor Controller: NEMA ICS 2,

AC general-purpose Class A manually operated, full-voltage controller for overload element, red pilot light, auxiliary contact, and push button operator.

2. Fractional Horsepower Manual Controller:

NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, pilot light, and toggle operator.

E. Magnetic Controllers

1. Magnetic starters shall be NEMA 2 or NEMA 4 (combination non-fused for 3-phase motors) type with auxiliary contacts as required to match the specified sequence of control. Starters shall be Furnas, Allen and Bradley or Cutler Hammer- no other substitutes.

2. Starters shall have solid state overload protection.

3. Auxiliary contacts shall be normally open or normally closed as required for proper control. Provide integral control transformers when required, with fused primary and secondary. Refer to the sequence of operations for all systems and provide auxiliary contacts at starters as necessary. (Including Fire Alarm System Interlock)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe, duct, and equipment hangers, supports, and associated anchors.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.
- E. Place hanger and support inserts and sleeves.
- F. Through-penetration firestopping.

1.2 REFERENCES

- A. ANSI/ASME B31.1 - Power Piping
- B. U.L. Fire Resistant Directory. Through Penetration Fire Stop Systems for walls, floors, and partitions.

1.3 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Indicate hanger and support framing and attachment methods.
- C. Indicate U.L. system number for all Penetration Systems thru fire rated walls or partitions.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 to 4 inches and Cold Pipe Sizes 6 inches and over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- E. Vertical Support: Steel riser clamp.
- F. Un-Insulated Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- G. Shield for Insulated Piping 1 inch and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- H. Shield for Insulated Piping 2-1/2 Inches and Larger: Pipe covering protective saddles.

2.2 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.3 INSERTS

- A. Inserts: Malleable iron case of (galvanized) steel and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.
- B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with schedule 40 steel pipe.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Schedule 40 steel with U.L. listed fire barrier caulk per the requirements of the U.L. Fire Resistance Directory Fire Stop System.
- D. Sleeves for Round Ductwork: Form with galvanized steel.
- E. Sleeves for Rectangular Ductwork: Form with galvanized steel.
- F. Stuffing or Fire Stopping Insulation: As required by the applicable U.L. System for Through Penetration Fire Stop System.
- G. Caulk: Per applicable U.L. Through Penetration Fire Stop Systems.
- H. Wrap for insulated piping penetrations of rated walls and floors: Elastomeric intumescent wrap strip per U.L. Fire Resistance Directory - through Penetration Fire Stop Systems.

2.5 FABRICATION

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Provide copper plated hangers and supports for un-insulated copper piping.

2.6 FINISH

- A. Prime coat all steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are included.

B. Provide one (1) prime coat and one (1) finish coat of paint on all exterior or interior exposed steel hangers and supports.

2.7 DUCT SUPPORTS

A. Ductwork supports, spacing, etc. shall be as directed by SMACNA.

2.8 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Systems or devices listed in the U.L. Resistance Directory under categories XHCR and XHEZ shall be used to protect all mechanical piping or conduit (temperature controls) penetrations of fire rated construction, the system used shall conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance. Systems or devices must be asbestos-free.

B. The systems withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.

C. Acceptable manufacturers and products shall be those listed in the U.L. Fire Resistance Directory for the U.L. System involved.

D. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

E. Forming materials: As classified under category XHKU in the U.L. Fire Resistance Directory.

PART 3 - EXECUTION

3.1 INSERTS

A. Where concrete slabs form finished ceiling, provide inserts to be flush.

3.2 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inches	10'-0"	1/2"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within **12 inches of each horizontal elbow.**

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

- E. Support vertical piping at every floor.
- F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Support riser piping independently of connected horizontal piping.

3.3 EQUIPMENT BASES AND SUPPORTS

- A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- B. Furnish and install all required supplemental supports for equipment, piping, ductwork, etc. Construct supports of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure. Do not obstruct service or operating clearances.
- C. Provide rigid anchors for pipes after vibration isolation components are installed.
- D. Provide seismic anchors for all mechanical equipment and associated supports per building code requirements.

3.4 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

3.5 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

END OF SECTION

SECTION 23 05 48
SEISMIC RESTRAINT OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This Section includes the following:

1. Restraining braces, cables and anchors for HVAC equipment, ductwork and piping.
2. Gas Piping Plan for Local Code Review and Approval
3. Manufacturer's field observation of seismic component installation with letter of acceptance to local code authority

1.2 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.
2. Refer to ASCE 7-05

B. Seismic-Restraint Loading:

1. As defined by local code and the authority having jurisdiction.
2. Assigned Seismic Use Group or Building Category as Defined in the Building Code.

Occupancy Category = III

Seismic design Category = D

Component Importance Factor (Ip)

Hazardous Piping Systems (Natural Gas) = 1.5

HVAC Systems Equipment, Piping & Components = 1.5

1.3 SUBMITTALS

A. Submittal Data Requirements

1. The manufacturer of seismic restraints shall provide submittals for products as follows:

a. Descriptive Data:

- 1) Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
- 2) Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.

b. Shop Drawings:

- 1) Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
- 2) Provide all details of suspension and support for ceiling hung equipment.
- 3) Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.

- 4) Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
- 5) Provide a **gas piping plan** showing the locations of all required transverse and longitudinal restraints for the natural gas piping on this project. Gas piping plan shall be prepared by the seismic bracing system manufacturer and must be sealed by an Engineer licensed in Tennessee. Submit to the office of local code enforcement with a copy to the architect and engineer

c. Seismic Certification and Analysis:

- 1) Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.
- 2) All restraining devices shall have a preapproval number from California OSHPD or some other recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45° to the weakest mode.
- 3) Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the code required seismic forces acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

d. Field Services:

- 1) The seismic bracing **manufacturer's representative** shall visit the site and observe the installation of the seismic bracing components. Manufacturer's representative shall submit a letter to the office of local code enforcement assuring the proper installation of the seismic bracing components. Letter shall be submitted to local code enforcement prior to the first mechanical inspection and each subsequent inspection.

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the Building Code unless requirements in this Section are more stringent.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If pre-approved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

A. Provide seismic restraints in accordance with the requirements of the 2006 International Building Code for the following:

1. All natural gas piping.
2. All other piping in Mechanical Equipment Rooms 1-1/4" diameter and larger, all piping (other than gas) outside Mechanical Equipment Rooms 2-1/2" diameter and larger and all conduits 2-1/2" diameter and larger. Exception: Piping suspended by individual hangers 12 inches or less in length, (except natural gas piping) as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced.
3. All rectangular ducts with cross-sectional area 6 square foot or larger. Exception: No bracing is required if the duct is suspended by hangers 12 inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached. Hangers must be positively attached to the duct within 2 inches of the top of the duct with a minimum of two #10 sheetmetal screws.
4. All Mechanical Equipment

B. Restraints for ductwork and piping (where required) shall be in accordance with the S.M.A.C.N.A. Seismic Restraint Manual as applicable for each portion of the work.

C. Where possible, hangers and supports for ducts and pipes shall not exceed a length of 12 inches.

D. Coordinate bracing methods with vibration isolation systems. Use cable restraints, in accordance with S.M.A.C.N.A. Restraint Manual, to prevent short circuiting vibration isolation devices.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hilti, Inc.
2. Kinetics Noise Control.
3. Amber/Booth.
4. Mason Industries

F. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

G. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

H. Hanger Rod Stiffener: Reinforcing steel angle clamped] to hanger rod.

I. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

J. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

K. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Division 07 for installation of roof curbs, equipment supports, and roof penetrations.

B. Coordinate concrete anchors with Division 03. Coordinate depth of all embedded items and anchors with the structural concrete (housekeeping pad or slab) depth prior to the start of any construction.

C. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by the seismic bracing component manufacturer and the authority having jurisdiction.

D. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

E. Ductwork Restraints: Comply with the requirements of the SMACNA Seismic Restraint Manual.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by the seismic bracing component manufacturer and the authority having jurisdiction.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

J. Drilled-in Anchors:

1. Coordinate embedded anchor depths prior to the pouring of any concrete slabs or pads. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 23 Section "Hydronic Piping" for piping flexible connections.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's representative for all seismic components shall review installation and verify systems are installed in accordance with the manufacturer's recommendation.

3.5 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.2 REFERENCES

- A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. ASHRAE - 1984 Systems Handbook: Chapter 37, Testing, Adjusting and Balancing.
- C. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.3 SUBMITTALS

- A. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.
- B. Prior to commencing work, submit draft reports indicating adjusting, balancing, and equipment data required.
- C. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
- D. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- E. Include detailed procedures, agenda, sample report forms.

1.4 QUALIFICATIONS

- A. Independent contractor, **Certified by AABC or NEBB**, with minimum five years documented experience.

1.5 REPORT FORMS

- A. Submit reports on AABC National Standards for Total System Balance or NEBB forms.
- B. Forms shall include the following information:
 - 1. Title Page:
 - a. Company name
 - b. Company address
 - c. Company telephone number
 - d. Project name
 - e. Project location
 - f. Project Architect

- g. Project Engineer
- h. Project Contractor
- i. Project altitude

- 2. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model
 - d. Serial number
 - e. Range
 - f. Calibration date

- 3. Air Moving Equipment:
 - a. Location
 - b. Manufacturer
 - c. Model
 - d. Air flow, specified and actual
 - e. Return air flow, specified and actual
 - f. Outside air flow, specified and actual
 - g. Total static pressure (total external), specified and actual
 - h. Inlet pressure
 - i. Discharge pressure
 - j. Fan RPM
 - k. Cooling coil air pressure drop (wet coil) specified versus actual

- 4. Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model
 - d. Air flow, specified and actual
 - e. Total static pressure (total external), specified and actual
 - f. Inlet pressure
 - g. Discharge pressure
 - h. Fan RPM

- 5. Electric Motors:
 - a. Manufacturer
 - b. HP/BHP
 - c. Phase, voltage, amperage; nameplate, actual, no load.
 - d. RPM
 - e. Service factor
 - f. Starter size, rating, heater elements

- 6. Air Distribution Test Sheet:
 - a. Air terminal number
 - b. Room number/location
 - c. Terminal type
 - d. Terminal size
 - e. Area factor

- f. Design velocity
- g. Design air flow
- h. Test (final) velocity
- i. Test (final) air flow
- j. Percent of design air flow

1.6 QUALITY ASSURANCE

A. Agency shall be company specializing in the adjusting and balancing of systems specified in this Section with minimum five years documented experience. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.

B. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE - Systems Handbook or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.7 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

PART 2 - PRODUCTS

A. This part is not used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before commencing work, verify that systems are complete and operable. Ensure the following:
1. Equipment is operable and in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Correct fan rotation.
 7. Fire and volume dampers are in place and open.
 8. Coil fins have been cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage has been minimized. (All ducts are sealed)
 12. No air leakage at cooling coil or duct connections to coil.
- B. Report any defects or deficiencies noted during performance of services to Architect/Engineer.
- C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
- D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. Adjust air handling systems to plus or minus 5 percent for supply return and exhaust systems from figures indicated.

3.4 ADJUSTING

A. Recorded data shall represent actually measured, or observed condition.

B. Permanently mark settings of dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return and exhaust air quantities at site altitude.

B. Measure air quantities at air inlets and outlets.

C. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

D. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

E. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

F. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Ductwork insulation and accessories.
- B. Piping Insulation and Accessories.

1.2 REFERENCES

- A. ANSI / ASTM C547 - Mineral Fiber Pre-Formed Pipe Insulation.
- B. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- C. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- D. ASTM E84 - Surface Burning Characteristics of Building Materials.
- E. NFPA 255 - Surface Burning Characteristics of Building Materials.
- F. UL 723 - Surface Burning Characteristics of Building Materials.
- G. UL - Through Pipe Penetration Directory.

1.3 QUALITY ASSURANCE

- A. Applicator: Company specializing in ductwork insulation application.
- B. Materials: UL listed; flame spread/fuel contributed/smoke developed rating of 25 / 30 / 50 in accordance with ASTM E84.
- C. Insulation systems at pipe penetrations of fire rated construction shall be as required by UL - No exceptions. The requirements of UL shall supersede this section where pipes penetrate rated walls or floors.

1.4 SUBMITTALS

- A. Include product description, list of materials and thickness for each service, and locations.
- B. Submit manufacturer's installation instructions under provisions of Section 15010.

1.5 DUCT SIZING FOR LINER (RECTANGULAR DUCTS)

- A. Duct sizes shown on the drawings are **inside sheet metal dimensions** unless noted otherwise. Allowance has been made for internal liner where applicable.

PART 2 - PRODUCTS

2.1 DUCT INSULATION MATERIALS

- A. Acceptable Manufacturer: Owens Corning Fiberglass Corporation.

- B. Type "A" flexible glass fiber **wrap**, ANSI/ASTM C612, commercial grade "K" value of 0.29 at 75 degrees F minimum 1.0 pcf density; 0.002 inch foil scrim facing.
- C. Type "B": Flexible glass fiber **liner**; ANSI/ASTM C553; 'k' value of 0.26 at 75 degrees F; 2.0 lb/cu ft minimum density; coated air side for maximum 4,000 ft/min air velocity.
- D. Adhesives: Waterproof fire-retardant type.
- E. Lagging Adhesive: Fire resistive to ASTM E84.
- F. Mechanical Liner Pins: Spot welded to duct with integral head or press-on head.

2.2 PIPE INSULATION

- A. Type A: Glass fiber insulation: ANSI / ASTM C547; 'k' value of 0.24 at 75 degrees F; noncombustible as manufactured by Owens-Corning. All service kraft paper vapor barrier jacket.
- B. Type B: Flexible closed cell insulation; "K" value of 0.255 at 75 degrees F equal to Halstead or Armaflex. Tubular (for piping) or sheet type (for pump bodies, etc.)
 - 1. Joint Sealant: Closed cell elastomeric tape, 1/8" x 2" wide.
 - 2. Exterior Sealant: Synthetic resin protective paint.
 - 3. Tubular for piping - pre-slit insulation is not acceptable.

2.3 PIPE INSULATION ACCESSORIES

- A. Insulation Bands: 3/4 inch wide, stainless steel of 0.007 inch thick.
- B. Insulating Cement: ANSI / ASTM C195; hydraulic setting mineral wool.
- C. Finishing Cement: ASTM C449.
- D. Fibrous Glass Cloth: Untreated; 9 oz / sq yd weight.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install materials after ductwork and piping has been tested and approved.
- B. Clean surfaces for adhesives.

3.2 DUCT INSULATION INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Liner (Type B) Application:
 - 1. Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners **in addition** to 100% coverage of adhesive. Seal and smooth joints. Do not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 2. Seal all joints and seams in the ductliner system. "Butter" all exposed/trimmed edges. Provide metal nosing over exposed edges of liner facing the airstream where ducts are terminated with "open ends".
- C. Plenum Application:

1. Adhere insulation on interior surface of plenum with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners. Seal and smooth joints. Do not use nail-type fasteners.

3.3 DUCT INSULATION SCHEDULE

INSULATION DUCTWORK	TYPE	THICKNESS	FINISH
Plenums (supply & return) Internal Lining in Rectangular	Type B	1"	None
Supply and Return Ducts Round Supply, Return and Outside	Type B	1"	None
Air Ducts Rectangular Supply and Return Air	Type A	2"	FSK
Ducts and Plenums in Un-Conditioned Space *	Type A	2"	FSK

* - All rectangular supply and return ductwork and plenums in the un-conditioned portion of the building (at units on platform) shall be externally wrapped with 2" thick Type "A" insulation. This ductwrap insulation shall be in addition to the 1" internal liner for these ducts

3.4 PROTECTION OF WORK - DUCT INSULATION

A. Protect duct insulation at all times from damage, moisture and dust accumulation, before and after installation. Do not allow insulation materials to get wet. Insulation allowed to get wet shall be discarded and shall not be installed. Allowing the insulation to "dry out" is not acceptable.

B. Protect stored ductliner at the site with protective covers and with duct sections elevated off the floor.

C. Protect open ends of ductwork and register openings in ductwork with covers to prevent construction dust build-up on the liner.

3.5 PIPING INSULATION INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Continue insulation with vapor barrier through penetrations, except as noted.

C. In exposed piping, locate insulation and cover seams in least visible locations.

D. Neatly cutout and seal insulation at all cleanouts in drain piping. Seal to maintain insulation system vapor barrier.

E. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.

F. Neatly finish insulation at supports, protrusions, and interruptions.

G. Jackets:

1. Indoor, Concealed Applications: Insulated pipes conveying fluids *above* ambient temperature shall have standard all service jackets, with or without vapor barrier, factory-applied or field-applied. Insulate fittings and joints with factory pre-molded insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. No exceptions. Neatly bevel and seal insulation at valves. PVC fitting covers may be used over pre-molded fitting insulation. PVC elbow covers with fiberglass insulation stuffing shall not be used.
2. Indoor, Concealed Applications: Insulated pipes conveying fluids *below* ambient temperature shall have vapor barrier jackets, factory-applied. Insulate fittings, joints, and valves with **factory pre-molded insulation** of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive. **PVC jackets are not acceptable.**
3. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications.
4. Provide 0.016" smooth aluminum jacket for all fiberglass (Type "A") pipe insulation located outside the building.
5. All exterior exposed portions of closed cell foam (Type "B") insulation shall be protected with minimum 2 coats weatherproof synthetic resin sealant.

3.6 SCHEDULE

PIPING	TYPE	INSULATION PIPE SIZE	THICKNESS INCH
Condensate Drains	A or B	All	½ "
Refrigerant Piping	B	All	½ "

Note: Insulation types, thicknesses, density, etc. at penetrations of fire rated construction shall be as required by the U.L. Fire Resistance Directory.

END OF SECTION

SECTION 23 09 00
CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Automatic temperature control system.
- B. Temperature control wiring.

1.2 SCOPE OF WORK

- A. Complete System of automatic temperature controls including all wiring, terminals, relays, thermostats, temperature sensors, switches, dampers, etc. for a complete, automatic temperature control system as specified herein.
- B. All HVAC interlock wiring and control wiring shall be furnished and installed under Division 23. All wiring shall be installed in conduit. See Division 26 for installation requirements for wiring and conduit. Comply with NEC and Division 26.
- C. All starters associated with the HVAC system shall be provided under Division 23. Coordinate with Division 28 and equipment supplier. Division 23 shall provide all required starters.
- D. Division 23 HVAC Contractor shall furnish, mount and wire all required duct smoke detectors for HVAC unit fan shut-down control per requirements of the International Mechanical Code. Upon activation (sensing of smoke) the detector shall shut-down all operational capabilities of the air handling unit in accordance with the listing of the appliance. Actuation of any duct smoke detector shall activate a visual and audible alarm in an approved location in the space. Coordinate with the local authority having jurisdiction prior to beginning any installation. Comply with International mechanical Code and local authority having jurisdiction. This building does not have a Fire Alarm System.

1.3 REFERENCES

- A. ASHRAE 85 - Automatic Control Terminology for Heating, Ventilating, Air Conditioning.

1.4 SYSTEM DESCRIPTION

- A. Provide all labor, equipment, material, design, coordination, wiring, starters, fees, permits, etc., as required to complete the installation specified herein and/or shown or scheduled on the Bid Documents for a complete, automatic temperature control system.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Submit descriptive data wiring diagrams and sequence of operation.
- C. Product Data: Provide data for each system component.
- D. Manufacturer's Installation Instructions: Include for all manufactured components.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01720.

- B. Accurately record actual location of control components, including panels, thermostats, and sensors.
- C. Revise shop drawings to reflect actual installation and operating sequences.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01725.
- B. Include interconnection wiring diagrams complete field installed system with identified and numbered, system components and devices.

1.8 COORDINATION

- A. Ensure installation of components is complementary to installation of similar components in other systems.
- B. Coordinate installation of system components with installation of mechanical systems equipment.
- C. Ensure system is completed and all devices function properly and in accordance with the manufacturer's recommendations.
- D. The controls contractor shall have a technician on site during the testing and balancing portion of the work to assist the test and balance contractor with the verification of all sequences of operation. Technician shall be thoroughly familiar with the building controls systems. Coordinate with Section 23 05 93.

1.9 WARRANTY

- A. Provide one (1) year warranty for all controls under provisions of Section 01740.

1.10 OWNER TRAINING

- A. Provide up to four (4) hours training for the Owner on complete operation of Temperature Controls System and Sequence of Operation. Include training on setting programmable thermostats and smoke detectors and associated alarm.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All temperature control and interlock wiring shall be furnished and installed by this contractor. All wiring shall comply with NEC, as well as the minimum requirements specified in Division 26 of this project manual. **All temperature control wiring shall be installed in EMT conduit. - No exceptions.**

2.2 THERMOSTATS

- A. Thermostats for control of split systems shall be low voltage, 7-day, 24-hour, auto changeover programmable type with integral "manual over-ride" switch to manually over-ride the timeclock and place the systems into "occupied" operation for up to 4-hours duration.

B. Control for packaged thru-wall units shall be integral to the unit with separate cooling, heating and fan controls.

C. Natural gas unit heaters shall be controlled by low-voltage heating only wall thermostats. Thermostats shall have integral thermometer. Protect each unit heater thermostat with protective wire thermostat guards.

D. Mount all thermostats at 48" AFF.

PART 3 - INSTALLATION

3.1 GENERAL

A. The complete installation shall comply with applicable laws and ordinances, utility company regulations, and applicable requirements of the following:

1. NFPA - National Fire Protection Association.
2. UL - Underwriter's Laboratories.
3. NEC - National Electric Code.
4. NEMA - National Electrical Manufacturer's Association
5. OSHA - Occupational Safety and Health Act
6. Standard Building Code.

B. The Contractor shall comply with all requirements for permits, licenses, fees, and codes. Permits, licenses, fees, inspections and arrangements required for the work under this contract shall be obtained by the contractor, at his expense, and made available at the completion of the work.

C. Basic Materials and Methods

1. Conduits shall be EMT and continuous where runs are exposed. All fittings are to be same manufacturer as conduit compatible with conduit material.
2. Conduits shall be sized appropriately for number of conductors per NEC and per local electrical code requirements.
3. Conduits shall be hacksaw cut square and reamed smooth, and threads shall be full length so that conduit ends will butt in couplings.
4. All boxes shall be secured with bushings and double locknuts.
5. Where conduits are exposed, the Contractor shall run conduit parallel and at right angles to building lines and group in banks where possible. This applied to vertical and horizontal runs.
6. Conduit Bends shall be made using tools specifically designed for this purpose to prevent kinks or flattened out areas.
7. Paint all exposed conduits per the Architect.
8. Seal all conduit penetrations of fire rated walls per U.L. Fire Resistance Directory. Refer to Section 23 05 29.

3.2 SEQUENCE OF OPERATION

A. Split Systems:

1. Each unit shall be controlled by its respective wall mounted, low voltage programmable thermostat. Contractor shall make initial timeclock settings for the owner and shall provide training for owner on making adjustments. Set "occupied" start times well in advance of the anticipated arrival of occupants so that the building will be at occupied temperatures when workers arrive in the morning. Supply fans shall cycle with the thermostat:

Occupied Cooling	74 degrees F
Un-Occupied Cooling	90 degrees F
Occupied Heating	71 degrees F
Un-Occupied Heating	60 degrees F

2. All control and interlock wiring shall be in conduit.
 3. Each split system air handling unit shall have an 8 inch diameter outside air runout. Connect 8 inch diameter fresh air runout to the return inlet of each unit to admit fresh air to the system. Each fresh air runout duct shall be equipped with a low voltage motorized damper. Motorized damper (24 volt actuator) shall be interlocked with its respective AHU blower to open when the blower is "ON" and to close when the AHU blower is "OFF". Provide manual damper in each O.A. duct for airflow balancing.
 4. Provide UL listed low voltage duct smoke detectors in the return inlet of each air handler for fan shutdown control in accordance with the International Mechanical Code. Locate in the return airstream prior to mixing with fresh air. Smoke detectors and complete audible and visual alarm (per IMC) shall be furnished and wired by Division 23 HVAC Controls Contractor. This building does not have a fire alarm system. HVAC controls contractor to mount in the duct and provide all required fan shutdown interlock wiring, alarm wiring and alarm devices per the requirements of the local authority having jurisdiction. Detectors shall interrupt operation of their respective unit and signal an alarm whenever smoke is detected.
- B. Each unit heater shall be controlled by its respective low voltage wall thermostat.
- C. Exhaust fan F-1 shall be manually controlled. Provide motor-rated line voltage on/off switch with pilot light. Switch shall be supplied with the fan. Refer to electrical drawings for power wiring.

3.3 DIAGNOSTIC CHECKS

- A. Verify all thermostats are correctly wired to the proper units as an integral part of the installation.
- B. Verify the calibration of all thermostats with calibrated thermometer

END OF SECTION

SECTION 23 11 23
NATURAL GAS PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Natural Gas piping system.
- B. Pipe and pipe fittings.
- C. Valves.
- D. Painting of exterior exposed piping.
- E. Modifications to existing gas service.

1.2 RELATED WORK

- A. Section 09900 - Painting.
- B. Section 230529 - Hanger and Supports for HVAC piping and equipment.
- C. Section 230548 - Vibration and Seismic Controls for HVAC piping and equipment.

1.3 REFERENCES

- A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- B. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.
- C. ANSI/AWS D1.1 - Structural Welding Code.
- D. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- E. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless, for Ordinary Uses.

1.4 QUALITY ASSURANCE

- A. Valves: Manufacturer's names and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 15010.
- B. Include data on pipe materials, pipe fittings, valves and accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Store and protect products under provisions of Section 01600.
- C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 NATURAL GAS PIPING BELOW GRADE

- A. Steel Pipe: ASTM A53 or A120, schedule 40 seamless black steel pipe with polyethylene protective wrap. Welded joints. Cathodic protection as recommended by the local utility company.
- B. Plastic Pipe: ASTM D1248 Polyethylene pipe subject to the approval of the local Authority having jurisdiction. Joints: ASTM D2513 heat fusion.

2.2 NATURAL GAS PIPING ABOVE GRADE

- A. Steel Pipe Over 2 Inches, all Concealed Piping and all piping over 7" W.C. pressure: ASTM A53 or A120, Schedule 40 black seamless pipe. Fittings: ASTM A234, forged steel welding type. Joints: ANSI/AWS D1.1, welded.
- B. Low Pressure Steel Pipe, 2 Inches and Under: ASTM A53 or A120, Schedule 40, black seamless pipe. Fittings: ANSI/ASME B16.3 Malleable Iron. Joints: Screwed.

2.3 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 inches and Under: 150 psig malleable iron unions for threaded ferrous piping.
- B. Pipe Size Over 2 Inches 150 psig forged steel slip-on flanges for ferrous piping.

2.4 GAS COCKS

- A. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.
- B. Over 2 Inches: Cast iron body and plug, non-lubricated, teflon packing, flanged ends.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install piping to conserve building space and not interfere with use of space.
- B. Group piping whenever practical at common elevations.
- C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide clearance for access to valves and fittings.

- E. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with the Architect.
- F. Establish elevations of buried piping outside the building to ensure not less than two feet of cover. Gas piping must be in separate trench from other utilities.
- G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- H. Install valves with stems upright or horizontal, not inverted.
- I. Provide one plug cock wrench for every ten plug cocks sized 2 inches and smaller, minimum of one. Provide each plug cock sized 2-1/2 inches and larger with a wrench with set screw.
- J. Paint all exposed piping as directed by the Architect.
- K. Do not install underground gas in same trench as other underground utilities.
- L. Do not install valves concealed. All gas valves must be accessible.
- M. Install tracer wire in trench above underground piping where plastic pipe is installed.
- N. Protect all piping above grade subject to damage (automobiles, fork lifts, etc.) with concrete filled pipe bollards or other heavy-duty protective type guards meeting the approval of the architect.

3.3 APPLICATION

- A. Use welded connections for all high pressure gas piping (above 5-ounces), all gas piping over 2" in size, all underground piping and all concealed piping.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Paint all exterior exposed gas piping and all gas piping and supports in the mechanical attic with two coats of weatherproof protective paint. Color shall be as directed by the Architect.
- D. Provide cathodic protection for all underground steel piping as recommended by the Local Utility Company.
- E. The minimum acceptable gas line size shall be 3/4".

3.4 GAS SERVICE

- A. Modify and make connections to the existing natural gas service at this site. Coordinate added demand with MLGW and pay all cost.

3.5 FINAL CONNECTIONS

- A. Make final gas connections to all natural gas appliances and fixtures; including owner furnished equipment and equipment furnished by other trades.
- B. Make final connection in strict compliance with the manufacturer's recommendations.
- C. Provide dirtleg, union and cutoff valve at all gas line connections to gas equipment. The dirtleg union and cutoff valve shall be the size called for on the drawings (not connection size). Provide reducer as required immediately at unit connection.

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Refrigerant piping for air conditioning equipment.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Filter-driers.

1.2 RELATED SECTIONS

- A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.3 REFERENCES

- A. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers.
- B. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B31.5 - Refrigeration Piping.
- E. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

1.4 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASTM B31.5 unless indicated otherwise.

C. Liquid Indicators:

- 1. Use line size liquid indicators in main liquid line leaving condenser.

D. Valves

- 1. Use service valves on suction and discharge of compressors.
- 2. Use gage taps at compressor inlet and outlet.

1.5 SUBMITTALS

A. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

B. Test Reports: Indicate results of leak test.

1.6 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 for installation of piping system.
- B. Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state regulations.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site.
- B. Deliver and store piping and specialties in shipping containers with labeling in place.
- C. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- D. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 - PRODUCTS

2.1 PIPING

- A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.
- B. Copper Tubing to 7/8 inch OD: ASTM B88, Type K, annealed.
 - 1. Fittings: ASME B16.26 cast copper.
 - 2. Joints: Flared.
- C. Pipe Supports and Anchors:
 - 1. Conform to ASME B31.5. Refer to Section 23 05 29.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Size refrigerant lines, install refrigeration specialties and charge systems in strict accordance with the equipment manufacturer's instructions. Refrigerant line sizes indicated on the drawings are for reference only and must be confirmed with the equipment manufacturer. Follow manufacturer's "long line" installation application criteria where applicable.

- B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient. Route refrigerant piping to the outdoor condensing units concealed in the exterior wall cavity and in furred areas of the building. Do not run exposed to view except in the attic mechanical space. Do not drop exposed to view on the face of the exterior walls.
- C. Install piping to conserve building space and not interfere with use of space. Support all refrigerant piping from the building structure.
- D. Group piping whenever practical at common elevations and locations. Slope piping 0.40 percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access to concealed valves and fittings.
- I. Flood piping system with nitrogen when brazing.
- J. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.
- K. Fully charge completed system with refrigerant after testing. Comply with refrigeration equipment manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

- A. Test refrigeration system in accordance with ASME B31.5.
- B. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using electronic leak detector. Test to no leakage.
- C. Submit letter to the Architect confirming refrigeration system test with date and time of each test documented.

END OF SECTION

SECTION 23 31 13
METAL DUCTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Metal ductwork.
- B. Duct sealing.

1.2 RELATED WORK

- A. Section 230529 - Hangers and Supports for HVAC Piping and Equipment.
- B. Section 230700 - HVAC Insulation.
- C. Section 233300 - Air Duct Accessories.

1.3 REFERENCES

- A. ASHRAE - Handbook 1981 Fundamentals; Chapter 33 - Duct Design.
- B. ASHRAE - Handbook 1983 Equipment; Chapter 1 - Duct Construction.
- C. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- D. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- E. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- F. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
- G. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.
- H. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- I. SMACNA - HVAC Duct Construction Standards.

1.4 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A, ASHRAE and SMACNA Standards.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for low pressure and high pressure systems.
- C. Provide a hanger and support schedule.

1.6 QUALITY ASSURANCE

- A. SMACNA Duct Construction Manual shall be the minimum requirement for the air distribution system.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site per the manufacturer's recommendations.

B. Store and protect products per the manufacturer's recommendations. Protect all ductwork stored on site and the open ends of all installed ducts with protective covers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Duct: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having **G90** zinc coating for each side in conformance with ASTM A90.

B. Fasteners: Rivets, bolts, or sheet metal screws.

C. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

D. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except that **all joints shall be sealed**. Seal all longitudinal and transverse joints.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

E. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

F. Use double nuts and lock washers on threaded rod supports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Transition as required to connect new ducts to existing ducts. Seal connection airtight.

B. Provide openings in ductwork where required to accommodate thermometers, airflow measuring stations, and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

C. Located ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.2 ADJUSTING AND CLEANING

A. Clean duct system thoroughly to remove all accumulated dust and debris.

3.3 SEALING

A. Seal all joints of supply air, return air, fresh air, relief air and exhaust air ducts with duct sealant.

3.4 DUCT HANGER AND SUPPORTS

A. Provide duct supports and hangers in accordance with SMACNA. Provide seismic restraint complying with SMACNA where required by code. Anchor risers in the center of the vertical run to allow ends of riser free vertical movements. Where supports are required between structural framing member, provide suitable intermediate metal framing. Where C clamps are used, use retainer clips.

B. Provide all supplemental supports necessary for the proper support of all HVAC Ductwork as dictated by conditions in the field

3.5 COORDINATION

A. For purposes of clearness and legibility, drawings are essentially diagrammatic, and, although size and location of ductwork are drawn to scale wherever possible, the contractor shall make use of all data in all of the contract documents and shall verify this information at the building site. **THE DESIGN DRAWINGS ARE NOT INTENDED AS SHOP DRAWINGS AND THE CONTRACTOR SHALL VERIFY ALL SPACE REQUIREMENTS AND CLEARANCES FOR THE INSTALLATION OF THE MECHANICAL DUCTWORK WITH THE WORK OF ALL OTHER TRADES PRIOR TO BEGINNING ANY DUCT FABRICATION OR INSTALLATION.** Failure to properly coordinate all work prior to installation shall result in the contractor correcting all misplaced work at no cost to the Owner. Immediately notify the architect of any conflicts encountered during the course of the installation.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Volume control dampers.
- B. Fire dampers.
- C. Backdraft Dampers.
- D. Air Turning Devices.
- E. Flexible Duct Connections.
- F. Duct Access Doors.
- G. Duct Test Holes.

1.2 RELATED WORK

- A. Section 233113 - Metal Ducts.

1.3 REFERENCES

- A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- B. SMACNA - Low Pressure Duct Construction Standards.
- C. UL 33 - Heat Responsive Links for Fire-Protection Service.
- D. UL 555 - Fire Dampers and Ceiling Dampers.

1.4 SUBMITTALS

- A. Provide shop drawings for shop fabricated assemblies indicated, including volume control dampers, duct access doors, and duct test holes. Provide product data for hardware used.
- B. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
- C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.
- D. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch.

- E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.
- H. On externally insulated ducts, mount quadrant regulators on stand-off mounting brackets, bases or adapters to clear the insulation covering.

2.2 FIRE DAMPERS

- A. Furnish in accordance with NFPA 90A and UL 555.
- B. Furnish curtain type dampers of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream.
- C. Furnish multiple blade fire dampers with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- D. Fusible links, UL 33, shall separate at 212 degrees F.
- E. Provide 10% extra fusible links.
- F. All Dampers shall be U.L. listed.
- G. Duct access panels shall be provided at each fire damper location to provide adequate access to the damper for servicing.
- H. All damper components shall be by a single manufacturer.

2.3 BACKDRAFT DAMPERS

- A. Gravity backdraft dampers, size 18 x 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturers standard construction.
- B. Fabricate multi-blade, parallel action gravity balanced back-draft dampers of 16 gage galvanized steel with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.4 AIR TURNING DEVICES

- A. Multi-blade device with double-thickness airfoil blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.5 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 36 oz per sq yd, approximately 3 inches wide, crimped into metal edging strip.
- C. Leaded vinyl sheet, minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

2.6 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA Duct Construction Standards and as indicated.
- B. All duct access doors in rectangular ductwork shall be hinged. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes. All access doors must be hinged. Access doors with sheet metal screw fasteners are not acceptable.
- C. Perimeter gasketing for tight seal.
- D. Provide identification stenciling at all duct access doors to identify the fire protection device within. All lettering shall be minimum ½ " tall.

2.7 DUCT TEST HOLES

- A. Cut or drill temporary test holes in ducts as required to accomplish all airflow testing. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps. Duct tape over holes is NOT acceptable.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation. Provide permanent test holes only where shown on the plans.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions.
- B. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.
- C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- D. Provide fire dampers where indicated on the plans. All fire dampers shall be installed in accordance with the manufacturer's written installation instructions and SMACNA. Contractor shall also drop and reset each damper after installation. All resetting shall be done thru the duct access doors provided so as to verify that each access door is adequately sized/positioned. Provide SMACNA approved breakaway connections at each fire damper. Brace ducts on both sides of fire damper as necessary to prevent movement of the duct.

- E. Interrupt ductliner, at all fire dampers. Seal ductliner edges. Protect ductliner edges facing the air stream with metal nosing.
- F. Provide ductwrap insulation at all fire damper frames.

END OF SECTION

SECTION 23 37 13
DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Diffusers
- B. Registers and Grilles

1.2 RELATED WORK

- A. Section 233113 - Metal Ducts.

1.3 REFERENCES

- A. ADC 1062 - Certification, Rating and Test Manual.
- B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.
- C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- D. ARI 650 - Air Outlets and Inlets
- E. ASHRAE 70 - Method of Testing for Rating the Airflow Performance of Outlets and Inlets.
- F. SMACNA - Low Pressure Duct Construction Standard.

1.4 QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate performance of louvers in accordance with AMCA 500.

1.5 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A.

1.6 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Submit schedule of outlets and inlets indicating type, size, location, application and noise level at operating conditions.
- C. Review requirements of outlets and inlets as to size, finish and type of mounting prior to submitting product data.
- D. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 DIFFUSERS, REGISTERS AND GRILLES

A. Devices shall be of the type, size and manufacture as scheduled on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items in accordance with the manufacturer's instructions.

B. Check location of outlets and inlets to make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.

C. Install all diffusers, registers and grilles to ductwork with an air tight connection.

D. Frame styles for all ceiling mounted devices shall match the type of ceiling where shown to be installed.

E. Finish colors of all devices shall be as directed by the Architect.

F. Paint all visible duct inside diffusers and registers matte black.

END OF SECTION

SECTION 23 51 00
CHIMNEYS AND VENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Vents for high efficiency gas fired condensing furnace units.
- B. Vents for sealed combustion natural gas unit heaters

1.2 REFERENCES

- A. ASHRAE - Handbook, Equipment, Volume, Chapter "Chimney, Gas, Vent, and Fireplace Systems."
- B. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel- Burning Appliances.
- C. ANSI Z223.1 - The National Fuel Gas Code.

1.3 DESIGN REQUIREMENTS

- A. Factory built vents and chimneys used for venting natural draft appliances with NFPA 211 and UL listed and labelled.

1.4 SUBMITTALS

- A. Submit shop drawings
- B. Submit shop drawings indicating general construction, dimensions, weights, support and layout. Submit layout drawings indicating plan view and elevations. Coordinate with local code enforcement (field inspector).
- C. Submit manufacturer's installation instructions

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable ANSI Z223.1 code for installation of natural gas burning appliances and equipment.
- B. Conform to manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 COMBUSTION AIR AND VENT PIPING FOR CONDENSING FURNACES

- A. Vent piping for condensing furnaces shall be Schedule 40 PVC or as recommended by the equipment manufacturer. Size per manufacturer's recommendations.
- B. Vent each condensing furnace thru the roof. Pipe combustion air inlet completely from outdoors to intake opening at each unit.
- C. Comply with manufacturer's recommendations.

2.2 COMBUSTION AIR AND VENT PIPING FOR UNIT HEATERS

A. Vent piping for natural gas unit heaters shall be Type "B" dual wall vent as recommended by the equipment manufacturer. Metal-Fab or equivalent. Size per manufacturer's recommendations. Heaters shall be supplied with concentric vent kits for vertical (thru the roof) venting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Support vents from building structure, rigidly with suitable hangers and anchors to hold to shape and prevent buckling. Support vertical stacks to adjacent structural surfaces, or at roof penetrations.
- C. Pitch horizontal sections with positive slope up from fuel-fired equipment to chimney or stack.
- D. Level and plumb chimneys and vents.
- E. Clean flues and vents during installation, removing dust and debris.
- F. Paint all portions of concentric vent assemblies above the roof with weatherproof paint, minimum two coats. Color to match roof as directed by the Architect.
- G. Coordinate all concentric vent locations thru the roof with the mechanical field inspector prior to beginning vent installation.
- H. Coordinate venting of appliances with the work of other trades and verify all proposed vent routing and clearances prior to beginning any fabrication or installation.
- I. The exact locations of all furnace unit concentric vents shall be located as directed by the Architect to be as symmetrical as possible.
- J. Hold flue vents minimum 10 feet away from fresh air intakes.
- K. Caulk/seal all PVC vent piping penetrations of rated construction as required to maintain the integrity of the rating and per local code approval.
- L. Provide metal escutcheon collar where vents penetrate metal building roof. Provide thimble and patch/seal metal building insulation and vinyl jacket as required. Comply with metal building mfg's requirements.

END OF SECTION

SECTION 23 81 26
SPLIT-SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. High efficiency condensing type furnace units consisting of heater section, fan section and filters. Furnaces shall be vertical upflow arrangement as indicated on the plans.
- B. Vertical upflow direct expansion cooling coils with integral insulated casing and corrosion resistant sloped drain pan.
- C. 13 SEER Air cooled condensing units.

1.2 REFERENCES

- A. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- B. ARI 210 - Unitary Air-Conditioning Equipment.
- C. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 15010.
- B. Submit shop drawings and product data for manufactured products and assemblies required for this project.
- C. Indicate electrical service and duct connections on shop drawings and product data.
- D. Submit manufacturer's installation instructions.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data.
- B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Store and protect products under provisions of Section 01600.
- C. Protect units from physical damage by storing off site or protected location on site until ready for immediate installation of units.

1.6 WARRANTY

- A. Provide five year manufacturer's warranty on all refrigeration compressors; one year parts and labor and additional four years parts.
- B. Provide 20 year warranty on the heat exchanger; one year parts and labor and additional nineteen years parts.

1.7 EXTRA MATERIALS

- A. Provide one set of spare filters for each unit to be turned over to the owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Carrier, Trane or Lennox. Furnace section, cooling coil section and outdoor air cooled condensing units shall all be the same mfg and designed specifically for use with one another.

2.2 FURNACE UNITS

- A. Furnish and install High Efficiency Condensing Gas Furnace systems as indicated in the schedule. Furnaces shall be A.G.A. certified. Units shall be vertical upflow arrangement with side return inlet as indicated on the plans. Provide 2" thick disposable filters for each return inlet. Contractor shall furnish and install bottom inlet filter housing with tracks for 2" thick flat pleated filters and hinged filter access door with gasket seals to prevent air leakage. Comply with furnace mfg's recommendations.
- B. Secondary Heat Exchanger shall be polypropylene laminate coated. Primary serpentine heat exchanger shall be aluminized steel. Burners shall be aluminized steel.
- C. Unit shall have hot surface ignition control..
- D. Blower assembly shall consist of multi-speed direct drive motor, speed tap selector, factory wired blower controls and low voltage terminal board.
- E. Unit filters shall be 2" thick disposable.

2.3 DIRECT EXPANSION COOLING COILS

- A. Furnish and install fully cased direct expansion cooling coils designed to fit the furnace units. Coils shall be suitable for vertical airflow arrangement as required.
- B. Coil casing shall be fully insulated and shall completely encase the entire cooling coil assembly. Coil casing shall have external duct connection flange.
- C. Coils shall be constructed of aluminum fins bonded to seamless copper tubing.

D. Each coil section shall be equipped with a corrosion resistant condensate drain pan with female threaded brass insert pipe connections. Drain pan shall be sloped inside the coil casing to ensure proper drainage.

2.4 AIR COOLED CONDENSING UNITS

A. Furnish and install U.L. Listed outdoor air cooled condensing units of the capacities indicated on the unit schedules. Units shall have electrical characteristics to match the voltages shown on the electrical drawings. 13 SEER minimum efficiency.

B. Unit casing shall be galvanized steel with zinc phosphate coating and baked-on paint finish.

C. Condenser coil shall be copper tube, enhanced sine wave aluminum fin design. Coil fins shall have wire guard protection.

D. Compressors shall be scroll type. Compressors shall be mounted on vibration isolators and shall be protected with thermal overloads.

E. Condenser fan shall be direct drive, propeller fan type with vertical air discharge.

F. Refrigeration components shall include liquid and suction line service valves, liquid filter drier, full charge of compressor oil and a holding charge of refrigerant and crankcase heater.

G. Controls and safeties shall include: compressor short cycle timer, high and low pressure switches and winter start kit.

H. Unit electrical power shall require only a single electrical connection. Unit control circuit shall contain 24-volt transformer for unit controls.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that area is ready to receive work and opening dimensions are as indicated on shop drawings. Do not begin unit installation or ductwork fabrication until all space requirements are confirmed.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount horizontal air handling units on 1" thick neoprene isolator supports to permit installation of auxiliary drain pan below the units.

C. Install condensing units slab on grade as indicated on the plans.

D. Do not operate air handling units (furnace and coil section) without unit filters in place. Provide new filters for all units immediately prior to owner's occupancy of the building.

- E. Provide drain for condensing furnaces and cooling coils per manufacturers requirements.
- F. Spill condensate drain from each cooling coil into opening provided by plumbing. Install drain lines per mfg's recommendations. Insulate drain lines to prevent sweating.
- G. Provide galvanized auxiliary drain pans below all air handling units per IMC with separate auxiliary drain line (separate from the primary drain line) piped to spill to outdoors in a conspicuous location (as approved by the local mechanical field inspector) to serve as an alarm the primary drain is restricted.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Provide initial start-up and shut-down.
- B. Replace filters in all units operated during the construction phase with clean filters after the building has been substantially cleaned (immediately prior to owner's occupancy). Provide additional spare filters for each unit. (one complete filter change-out for each unit).
- C. Inspect the cooling coils of ALL units operated during the construction phase. Clean all dirty coils.

END OF SECTION

SECTION 26 00 00
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section specifies the basic electrical requirements for this project as well as the general requirements which apply to the work of Division 26 in addition to those stipulated in Division 01. Should any discrepancies exist between the requirements of Division 26 and those found in Division 01; the more stringent requirement shall govern except where the two requirements are contradictory in which case the Division 01 requirements shall govern.
- B. The electrical work required for this project consists of furnishing all labor, equipment and materials necessary to obtain complete and operational electrical systems as indicated on the drawings and as specified herein.
- C. The Contractor shall furnish all material and labor as required for the installation of the new electric service per the local power company's requirements. The Contractor shall coordinate with the local power company for all requirements.
- D. The Contractor shall furnish all material and labor as required for the installation of the new telecom service(s) per the local service provider(s)' requirements. The Contractor shall coordinate with the local service provider(s) for all requirements.
- E. The Owner will furnish and install all communications wiring and equipment and will make all final communications connections after empty conduit systems have been installed as specified herein.

1.2 CODES, STANDARDS AND PERMITS:

- A. The installation shall comply with the following:
 - 1. All applicable local and state wiring ordinances.
 - 2. The National Electrical Code (NFPA-70-2008).
 - 3. All applicable provisions of the Occupational Safety and Health Act (OSHA).
 - 4. Requirements of the power and telephone companies furnishing services to the project.
 - 5. International Building Code (2006 Edition).
 - 6. International Energy Conservation Code (2006 Edition).
 - 7. Life Safety Code (NFPA 101-2006).
 - 8. Americans with Disabilities Act (ADA).
- B. This contractor shall apply for, obtain, and pay for all permits required. At the conclusion of the installation, he/she shall secure a certificate of inspection, properly signed by the controlling building department, which shall state that all rules have been complied with and that the work is satisfactory.
- C. Should any part of the plans or specifications be found to be in conflict with applicable codes or ordinances, the contractor shall notify the engineer before submitting his/her bid.

1.3 TRADE NAMES AND EQUALS

- A. Manufacturer's trade names or catalog numbers used in these specifications and indicated on the drawings denote type, size, quality, and design of equipment desired.

- B. Where equipment is specified as “equal”, or “approved equal”, it shall mean equal in the opinion of the engineer. This contractor is free to offer substitutions for consideration as equal after the contract is signed; however, he shall be prepared to furnish specified materials where substitutions are not approved.

1.4 DELIVERY, STORAGE, AND HANDLING OF MATERIAL AND EQUIPMENT

- A. The contractor shall be responsible for the purchase, delivery, and storage of all materials and equipment indicated to be supplied under this section of the specifications, and it shall be his/her responsibility to schedule the delivery of materials and equipment at such stages of the work as will permit uninterrupted construction of all phases of the work.
- B. Where owner furnished equipment is to be turned over to this contractor for installation, it shall be the responsibility of this contractor to receive such equipment and store in a safe, dry location.
- C. This contractor shall do all required rigging, hoisting, transporting, etc., of all equipment furnished under this contract, and shall further furnish any additional structural members, as may be required, for the proper support of any and all equipment furnished hereunder.

1.5 USE OF DOCUMENTS:

- A. The scope of the electrical work for this project is not limited to the requirements of any one drawing, any portion of the drawings, any one specification division, or any portion of the specifications whose main theme is electrical. The scope of the electrical work for this project consists of all electrical work required to obtain complete and operating systems and equipment as indicated on or as can be reasonably inferred from all drawings and specifications.
- B. The drawings indicate diagrammatically the general arrangement of circuits and outlets, locations of switches, panelboards, electrically operated equipment & appliances and other work. This data is as accurate as planning can determine, but accuracy is not guaranteed. Field verification of all dimensions, locations, levels, etc., to suit field conditions is directed.
- C. Should any structural or mechanical interferences prevent the installation of conduit, setting of junction boxes and cabinets, arrangement of lighting fixtures and method of suspension, etc., in the locations indicated on the drawings, the necessary deviations therefrom must be made without additional cost to the owner, where relocation is not over five (5) feet from the location shown on the drawings.
- D. Review all drawings and adjust all work to conform to all conditions shown therein. Discrepancies between different drawings, or between drawings and specifications or codes and regulations governing the installation shall be brought to the attention of the Owner's Representative prior to the date of bid opening.
- E. The locations of equipment, motors, etc., as indicated on the drawings are approximate only. Verify all dimensions with the appropriate equipment installer before rough-in. Where conduit, wiring, service equipment, lights, switches, or other electrical equipment interfere with construction; remove, relocate and rearrange such material and equipment as required to make a complete and satisfactory installation.
- F. Motor sizes indicated on the drawings are approximate only and are subject to change to suit the standard motor drives of the various equipment manufacturers. Check electrical characteristics of motors actually installed and provide wiring and protective devices of proper size for those motors.
- G. Any offsets in conduit required or necessary to avoid interferences with structure, or the work of other trades, etc., shall be made at no additional cost to the owner.

- H. Refer to architectural and structural drawings for all dimensions of building spaces.

1.6 COORDINATION

- A. The electrical contractor shall coordinate his/her work with that of other subcontractors on the job and also with that of the owner in order that there be no delay in the proper installation and completion of the several parts of the work.
- B. This contractor shall use every precaution to protect the work of others, and he/she will be held responsible for all damage done by his workers to the work of other trades. He/she shall also protect his work from danger of breakage, dirt, foreign materials, etc., and shall replace all work so damaged.
- C. Coordinate phases of the work with the owner and other trades to allow the owner to continue normal business operations throughout the duration of the project. Any necessary power outages shall be scheduled for other than the owner's hours of operation, or be pre-arranged with the owner.

1.7 MANUFACTURER'S RECOMMENDATIONS

- A. Unless specifically indicated otherwise, all equipment and materials shall be installed in accordance with the best recommendation of the manufacturer. A copy of the manufacturer's installation recommendations shall be kept in the job superintendent's office and shall be available to the owner's representative at all times.

1.8 CUTTING AND PATCHING

- A. This contractor shall be responsible for all cutting and patching required for the installation of his work, and he/she shall employ workers skilled in the trades required for all cutting and patching work.
- B. This contractor shall be responsible for the proper location of all chases, recesses, and openings required for his work.
- C. This contractor shall provide all sleeves, etc., required for the introduction and placement of his work, and shall be responsible for the correct location of same.
- D. Beams or columns shall not be pierced without permission of the structural engineer, and then only as directed.

1.9 PROTECTION OF FLOORS

- A. This contractor's attention is directed to the need to protect finished floors, and he will be held responsible for damage he may do to finished floors. Where heavy equipment is to be moved across finished floors, this contractor shall make provisions to protect the floor.
- B. Where pipe cutting and threading operations are carried on by this contractor, he shall provide a suitable covering material over the floor which will assure that oil and pipe cuttings do not come in contact with the finished floor. Temporary floor covering shall be plywood or other materials as may be approved by the engineer.
- C. This contractor shall remove all temporary floor covering, as he completes his work in each area. Any damage resulting from activities of this contractor shall be repaired at his own expense.

1.10 PAINTING

- A. Painting of materials and equipment furnished under the electrical portion of the contract, if required, will be done under a separate section of the project specifications. The electrical contractor shall, however, refinish and restore to the original condition and appearance, all electrical equipment which has sustained damage to manufacturer's finish paint.
- B. All electrical equipment shall be provided with factory applied prime and finish paint, unless otherwise specified.

1.11 SHOP DRAWINGS (SUBMITTALS)

- A. Six copies of shop drawings and/or manufacturer's descriptive data of a nature to completely identify the equality of the material or equipment intended for installation shall be submitted for approval before beginning any construction and within thirty days after signing contract. Failure to submit data for approval within thirty days will be construed as meaning equipment called for by name will be furnished. Data shall be organized in same order as listed below, shall be submitted all in one three ring binder, indexed by flysheet on front page, each item tabbed and labeled, arranged in the order they appear in the specifications, and be bound in sets, all sets identical. No exception will be made to this procedure and time schedule.
- B. Each item submitted for review shall have submittal data preceded by a typewritten description (by contractor or item supplier) of the item. Description shall include make and model numbers and shall describe the item. List all options and accessories which are included. List any options or accessories shown on shop drawings which are not included.
- C. Submit 1/4" scaled plans of each electrical room depicting the locations of all equipment that will be installed. Refer to individual Division 26 specification sections for submittal data requirements.

1.12 RECORD DRAWINGS

- A. This contractor shall maintain a complete up-to-date set of record drawings and specifications on the job site. Drawings shall be maintained in a neat condition and shall clearly show any changes from original drawings and specifications.
- B. Contractor shall use a designed set of prints of the contract documents, as prepared by the engineer, to mark up for record drawing purposes.
- C. The contractor shall prepare a set of reproducible record drawings. These drawings and a set of specifications shall be turned over to the owner and shall become the property of the owner before final payment will be made.

1.13 MAINTENANCE MANUALS

- A. Contractor shall provide three (3) copies of operational and maintenance manuals for all equipment installed under this division of the specifications. The manuals shall include a list of spare parts and proper operational and maintenance procedures.
- B. The manuals shall be organized and fully indexed. Manuals shall consist of three-ring, hard back binders with appropriate dividers for each part.
- C. Manual contents shall include, but shall not be limited to the following:
 - 1. Name and address of contractor, equipment manufacturer and supplier.
 - 2. Set of approved shop drawings or approved submittal data.

3. Wiring diagrams and installation drawings.
4. Spare parts and replacement parts lists as recommended by the manufacturer.
5. Proper operational procedures and maintenance procedures.
6. Installation and operation manuals.
7. Maintenance and service manuals.
8. Copy of warranties and guarantees.

- D. Operating and maintenance manuals shall be turned over to the owner before final payment will be made.
- E. It shall be the responsibility of this contractor to maintain, warrant, clean, etc., any equipment supplied by this contractor until all installation and operating and maintenance manuals are turned over to the owner.

1.14 TESTS AND ADJUSTMENTS

- A. Furnish all materials, labor, instruments, etc., and all other services required for a complete and satisfactory test and adjustment of all electrical systems and equipment. Tests and adjustments shall be made prior to acceptance by local inspection authorities.
- B. Test all circuits to determine that they are free of short circuits and that phase conductors are not grounded.
- C. Check all motor controllers to determine that properly sized overload devices are installed.
- D. Check all electrical equipment for proper operation.
- E. Correct or replace at no additional cost to the Owner all equipment and/or wiring which tests prove to be defective or operating improperly.
- F. Thoroughly familiarize the Owner's designated representative with the proper operating procedures and maintenance requirements for all electrical systems and equipment.

1.15

1.16 TEMPORARY CONSTRUCTION POWER AND LIGHTING

- A. This contractor shall furnish and install all temporary wiring for construction power and lighting for the project as required.
- B. A temporary electrical service, if required, for construction power and lighting shall be obtained by this contractor in the name of the owner, who will pay all power and energy charges. Any cost for the temporary service connection shall be paid by this contractor.
- C. All temporary wiring for construction shall conform to Article 590 of the National Electrical Code and all applicable rules and regulations of OSHA.

1.17 FEEDER, SWITCH AND DEVICE RATINGS

- A. The sizes of feeders, motor starters, switches, protective devices, and other electrical devices indicated on the drawings for electrically operated equipment are based on the average current or horsepower ratings of electrically operated equipment of the same general types and sizes upon which the designs of the various systems are based. Horsepower and current ratings indicated on the drawings are for guidance only and shall not limit the size of the equipment or feeders.
- B. Check the current and horsepower ratings of all electrically operated equipment actually furnished and installed. Adjust the sizes of all feeders, starters, switches, protective devices and other electrical devices as required to provide proper protection and satisfactory operation of the equipment actually installed. This

shall include increasing to the next larger size, or decreasing to the next smaller size, any individual feeder, starter, switch, protective device, or other electrical device to match the equipment sizes actually installed, as required, except that no sizes shall be decreased without approval in writing from the Engineer.

1.18

1.19 EXCAVATION AND BACKFILLING:

- A. Perform all excavation and backfilling required for electrical work including necessary sheathing and bracing in accordance with the requirements of Division 31, "EARTHWORK."

1.20 SAFETY DEVICES

- A. Electrical equipment and wiring used during construction shall be installed and insulated in a manner to insure the safety of personnel.
- B. Provide suitable guards, signs, etc. to protect personnel from "hot" wiring in panelboards, junction boxes, etc. during the construction period.

1.21 GUARANTEE

- A. The contractor shall guarantee to the owner all work performed under this contract to be free from defects in workmanship and material for a period of one (1) year from date of final acceptance. Defects arising during this period will be promptly remedied by the contractor at his own expense upon notice by the owner. All lamps for lighting fixtures shall be excluded from this guarantee, but one (1) complete and operative set of lamps for lighting fixtures shall be in place at the time of final acceptance.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.
- C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Metal-clad cable, Type MC.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors to ensure they are free of short circuits.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. Dossert; AFL Telecommunications LLC.
 - 3. ERICO International Corporation.
 - 4. Fushi Copperweld Inc.
 - 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - 6. Harger Lightning and Grounding.
 - 7. ILSCO.
 - 8. O-Z/Gedney; A Brand of the EGS Electrical Group.
 - 9. Robbins Lightning, Inc.
 - 10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.

2. Stranded Conductors: ASTM B 8.
3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- 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. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 ACTION SUBMITTALS

A. Product Data: For steel slotted support systems.

1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Atkore International.
 - g. Wesanco, Inc.
2. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 5. Toggle Bolts: All-steel springhead type.
 - 6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting conduits without bolts shall not be used.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

1.2 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6, threaded type.
- C. IMC: Comply with ANSI C80.6 and UL 1242, threaded type.
- D. EMT: Comply with ANSI C80.3 and UL 797.
- E. FMC: Comply with UL 1; zinc-coated steel.
- F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
 2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

- H. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- C. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- D. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: GRC.
 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated.
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed and Subject to Physical Damage: GRC. Raceway locations include the following:
 - a. Shop.
 - b. Mechanical rooms.
 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 5. Damp or Wet Locations: GRC.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use setscrew or compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

- E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- F. Support conduit within 12 inches of enclosures to which attached.
- G. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from RNC to GRC before rising above floor.
- H. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- L. Expansion-Joint Fittings:
 - 1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- M. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations.
- N. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- O. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

- P. Locate boxes so that cover or plate will not span different building finishes.
- Q. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- R. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

SECTION 26 05 48

SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

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:
 - 1. Restraint channel bracings.
 - 2. Restraint cables.
 - 3. Seismic-restraint accessories.
 - 4. Mechanical anchor bolts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
- B. Delegated-Design Submittal: For each seismic-restraint device.
 - 1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic forces required to select seismic restraints.
 - 3. Seismic-Restraint Details:
 - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.

- c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:
 - 1. Refer to Structural Drawings.

2.2 RESTRAINT CHANNEL BRACINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.; a Division of Cooper Industries.
 - 2. Hilti, Inc.
 - 3. Mason Industries, Inc.
 - 4. Unistrut; Atkore International.
- B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Kinetics Noise Control, Inc.
 - 2. Loos & Co., Inc.
 - 3. Vibration Mountings & Controls, Inc.

- B. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.; a Division of Cooper Industries.
 - 2. Kinetics Noise Control, Inc.
 - 3. Mason Industries, Inc.
 - 4. TOLCO; a brand of NIBCO INC.
- B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.
- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.; a Division of Cooper Industries.
 - 2. Hilti, Inc.
 - 3. Kinetics Noise Control, Inc.
 - 4. Mason Industries, Inc.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

- B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
 1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.
- B. Install cables so they do not bend across edges of adjacent equipment or building structure.
- C. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- E. Drilled-in Anchors:
 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 5. Set anchors to manufacturer's recommended torque using a torque wrench.
 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.4 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification for conductors.
 - 2. Underground-line warning tape.
 - 3. Equipment identification labels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.2 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Tag: Type I:

1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: 4 mils.
3. Weight: 18.5 lb/1000 sq. ft..
4. 3-Inch Tensile According to ASTM D 882: 30 lbf, and 2500 psi.

2.3 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- E. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
- F. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service and feeder conductors.

- a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- C. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- D. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- E. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION

SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
 - 1. Distribution transformers.
 - 2. Buck-boost transformers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Indicate dimensions and weights.
 - 1. Wiring Diagrams: Power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Sector; Eaton Corporation; Cutler-Hammer Products.
 - 2. General Electric Company.
 - 3. Square D Co./Groupe Schneider NA; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices except for taps.
 - 1. Internal Coil Connections: Brazed or pressure type.
 - 2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
- B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Cores: One leg per phase.
- D. Enclosure: Totally enclosed, nonventilated, NEMA 250, Type 2.
 - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- E. Enclosure: Ventilated, NEMA 250,.
 - 1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- F. Transformer Enclosure Finish: Comply with NEMA 250.
 - 1. Finish Color: Gray.
- G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.
- H. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
- I. Energy Efficiency for Transformers Rated 15 kVA and Larger:
 - 1. Complying with NEMA TP 1, Class 1 efficiency levels.

2. Tested according to NEMA TP 2.

J. Wall Brackets: Manufacturer's standard brackets.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate. Nameplates are specified in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as specified in Section 260548.16 "Seismic Controls for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3.3 ADJUSTING

A. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.

1.3 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Panelboard schedules for installation in panelboards.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Enclosures: Surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 3. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Tin-plated aluminum.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2.3 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Square D; a brand of Schneider Electric.

- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - f. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- H. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components.
- B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Comply with NFPA 70.

- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

- A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GFR5352L.
 - c. Pass & Seymour; 2095.
 - d. Leviton; 7590.

2.5 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

- B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Single Pole:
 - 1) Cooper; AH1221.
 - 2) Hubbell; HBL1221.
 - 3) Leviton; 1221-2.
 - 4) Pass & Seymour; CSB20AC1.
 - b. Two Pole:

- 1) Cooper; AH1222.
- 2) Hubbell; HBL1222.
- 3) Leviton; 1222-2.
- 4) Pass & Seymour; CSB20AC2.

c. Three Way:

- 1) Cooper; AH1223.
- 2) Hubbell; HBL1223.
- 3) Leviton; 1223-2.
- 4) Pass & Seymour; CSB20AC3.

d. Four Way:

- 1) Cooper; AH1224.
- 2) Hubbell; HBL1224.
- 3) Leviton; 1224-2.
- 4) Pass & Seymour; CSB20AC4.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: Black.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

G. Adjust locations of service poles to suit arrangement of partitions and furnishings.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 4. Lugs: Suitable for number, size, and conductor material.
 5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Lugs: Suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Suitable for number, size, trip ratings, and conductor material.
 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 260548 "Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 51 00

LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 BALLASTS FOR LINEAR FLUORESCENT LAMPS

- A. General Requirements for Electronic Ballasts:
 - 1. Comply with UL 935 and with ANSI C82.11.
 - 2. Designed for type and quantity of lamps served.
 - 3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
 - 4. Sound Rating: Class A.
 - 5. Total Harmonic Distortion Rating: Less than 10 percent.
 - 6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
 - 7. Operating Frequency: 42 kHz or higher.
 - 8. Lamp Current Crest Factor: 1.7 or less.

9. BF: 0.88 or higher.
10. Power Factor: 0.95 or higher.

- B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.
- C. Ballasts for Low-Temperature Environments: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.

2.3 BALLASTS FOR COMPACT FLUORESCENT LAMPS

- A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
 1. Lamp end-of-life detection and shutdown circuit.
 2. Automatic lamp starting after lamp replacement.
 3. Sound Rating: Class A.
 4. Total Harmonic Distortion Rating: Less than 20 percent.
 5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
 6. Operating Frequency: 20 kHz or higher.
 7. Lamp Current Crest Factor: 1.7 or less.
 8. BF: 0.95 or higher unless otherwise indicated.
 9. Power Factor: 0.95 or higher.
 10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.4 BALLASTS FOR HID LAMPS

- A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features unless otherwise indicated:
 1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
 2. Minimum Starting Temperature: Minus 22 deg F for single-lamp ballasts.
 3. Rated Ambient Operating Temperature: 104 deg F.
 4. Open-circuit operation that will not reduce average life.
 5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.
- B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:
 1. Minimum Starting Temperature: Minus 20 deg F for single-lamp ballasts.
 2. Rated Ambient Operating Temperature: 130 deg F.
 3. Lamp end-of-life detection and shutdown circuit.
 4. Sound Rating: Class A.
 5. Total Harmonic Distortion Rating: Less than 20 percent.
 6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
 7. Lamp Current Crest Factor: 1.5 or less.
 8. Power Factor: 0.90 or higher.
 9. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 10. Protection: Class P thermal cutout.

2.5 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, lead-acid type.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.

2.7 FLUORESCENT LAMPS

- A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life 20,000 hours unless otherwise indicated.
- B. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at three hours operation per start unless otherwise indicated.
 - 1. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
 - 2. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).

2.8 HID LAMPS

- A. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

- B. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI 80, and color temperature 4000 K.

2.9 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Suspended Lighting Fixture Support:
 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Support each recessed light fixture independently of the associated ceiling grid. Support each downlight (<10lbs) with one (1) slack #12 safety wire. All other recessed fixtures (up to 2'x4' and <56lbs) shall be supported with two (2) #12 safety wires connected at opposite, diagonal corners. Wiring shall be looped through hanger tabs integral with fixture housings and shall be securely fastened to structure same as ceiling systems. Each end of safety wire shall be wrapped with minimum three (3) turns (1-1/2" length).
- E. Adjust aimable lighting fixtures to provide required light intensities.
- F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

END OF SECTION

SECTION 28 13 00
ACCESS CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Head-end Hardware and Software
- B. Field Panels
- C. Cards & Readers
- D. Electric Locks
- E. Request-to-Exit Devices
- F. Wiring

1.2 SUMMARY

A. Labor and Materials: Unless otherwise noted in the Drawings and Specifications, the Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the Work.

B. Specification Language: Specifications and notes are written in imperative and abbreviated form. Imperative language of the technical specifications is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting “shall”, “shall be”, “the Contractor shall”, and similar mandatory phrases by inference. The words “shall be” is supplied by inference where a colon (:) is used within product specifications.

1.3 REFERENCES

A. Contract shall be able to submit the project and customer information of customers for at least three other projects of similar size and complexity using similar technologies.

1. Shall include a minimum of the following:
 - a. Customer Name
 - b. Customer Point of Contact
 - c. Customer Point of Contact Phone Number and email address
 - d. Address of project
 - e. Title of Project
 - f. Type of project completed

1.4 CONTRACTOR DESIGN REQUIREMENTS

A. Contractor’s design shall conform to all applicable codes and ordinances. All electrical design, including the sizing and placement of conduit, raceways and conductors, shall be in accordance with NFPA 70: National Electrical Code, current version, unless local codes establish more stringent requirements.

B. Contractor’s design work is subject to review and approval by SCSO’s Project Manager.

C. Contractor’s design shall also include:

1. The addition of all wire, cable, conduit, connectors and junction boxes required for system operation.
2. Completed “as-built” documentation of all security systems, including documentation of existing

equipment, wiring, conduits, and raceways.

3. Other Work as defined within the Project Drawings and Specifications.

1.5 SYSTEM USER REQUIREMENTS

A. System Overview:

1. The contractor shall provide and install all controllers, devices and peripherals required to interface with the existing AMAG Technology security management system currently in use by the SCSO facility at this location.
2. System will consist of electronic access control for six (6) pedestrian doors as indicated on drawings and in the door schedule.

B. Required Access Control Hardware

1. Management system – Existing AMAG Technology Professional
2. The DBU
3. AMAG Technology eight door controller with integrated DBU.
4. Shall store firmware in non-volatile flash memory to allow for convenient updates through the head-end software application. The DBU shall store the cardholder and configuration database information in battery-backed memory so that loss of primary power will not cause the loss of the database.
5. The DCU shall support Wiegand communications to the reader. In order to provide higher levels of security, the DCU shall also support bi-directional, supervised communications to the reader. Door controllers that do not support encryption and supervision of reader communications are not considered equal

C. Network Communications

1. The first field panel in a chain of panels shall have the ability to communicate with its monitoring client PC over the local or wide area network. This shall be achieved by the addition of a network interface option module (except in the case of retrofit controllers) and provide a cost effective alternative configuration to a direct connection via a client PC's serial port. The network interface shall support both "10 base T" and "100 base TX" (10/100) communications speeds. The network interface shall support encryption utilizing AES algorithm.

D. Database Synchronization

1. To ensure synchronization of the distributed controllers' databases with a region's main database an internal checking process shall be provided within each controller. In the event of corruption of a controller's local database then it shall be able to detect this condition and automatically request the relevant data to be downloaded from it's local server. This action shall not require Operator intervention.
2. The system shall continue to provide access control functionality during this re-synchronization process.
3. Door lock release relays shall be minimally rated for 3 A @ 30 VDC for non-retrofit controllers, 2A@30VDC for retrofit controllers.

E. Power Supplies

1. Power supplies shall be UL approved for access control.

1.6 QUALITY ASSURANCE

A. Qualifications Of Contractor

1. Contractor shall be an installation and service contractor regularly engaged in the sale, installation, maintenance and service of access control systems.
2. Contractor shall have three years experience with the installation, start-up and programming of systems of a similar size and complexity to the one proposed.
3. Contractor shall be a factory authorized dealer of the system proposed for at least two years.
4. Contractor shall provide factory certified technicians to perform the installation of all intelligent controller components in this project. Evidence of the certification shall be in writing from the manufacturer and shall be on the technicians person at all times while on site.

B. Qualifications Of Technicians

1. All electronic systems Work shall be performed by electronic technicians thoroughly trained in the installation and service of specialty low-voltage electronic systems.
2. All 120 VAC power wiring and connections are to be performed by a qualified Journeyman Wireman, licensed to perform such Work in the SCSO.

C. Regulatory Requirements

1. All Work is to conform to all building, fire, and electrical codes and ordinances applicable in the SCSO. In case of conflict between the Drawings/Specifications and codes, the codes shall govern. Notify SCSO Project Manager of any such conflicts.
2. Contractor shall secure and pay for all licenses, permits, plan reviews, engineering certifications, and inspections required by regulatory agencies. Contractor shall prepare, at Contractor's expense, any documents, including drawings, that may be required by regulatory agencies.

D. Permits

1. The Contractor shall make application for and obtain any and all permits required by federal, state, county, city, or other authority having jurisdiction over the work.

1.7 WARRANTY

A. Contractor warrants that all work furnished (material and labor) under this Contract will be of good quality, free from faults and defects, and in conformance with the Project Drawings and Specifications.

B. Contractor shall provide a parts and labor guarantee on all Work. Unless otherwise specified herein, Contractor's guarantee shall be for a period of one (1) year from date of acceptance, except where any specific guarantees from a supplier or equipment manufacturer extends for a longer time.

C. Contractor's guarantee shall cover all costs associated with troubleshooting, repair, and replacement of defective work, including costs of labor, transportation, lodging, materials, and equipment.

D. Guarantee shall not cover any damage to material or equipment caused by accident, misuse, unauthorized modification or repair by SCSO, or acts of god.

E. Contractor shall promptly respond to SCSO's requests for service during the guarantee period. Contractor shall provide repair service as soon as reasonably possible upon request from SCSO, but in no case shall service response exceed 8 hours from time of request.

1.8 OWNER'S INSTRUCTIONS

A. Coordination With SCSO

B. Contractor shall closely schedule and coordinate his activities with designated SCSO representatives.

C. Contractor shall provide SCSO's Project Manager with a work plan on a weekly basis. Such work plan will

describe locations of intended activities, types of activities, and potential conflicts to facility operations.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All products not provided by SCSO shall be new and unused, and shall be of manufacturer's current and standard production.
- B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
- C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory operation.

2.2 PRODUCT AVAILABILITY

- A. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
- B. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

2.3 WIRE AND CABLE

- A. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.
- B. All cables shall be specifically designed for their intended use (direct burial, aerial, etc.).
- C. Comply with equipment manufacturers recommendations for wire and cable size and type.
- D. Comply with all applicable codes and ordinances.

2.4 ACCESS CONTROL SYSTEM - SYSTEM SPECIFICATIONS

A. Field Panels

- 1. AMAG Technology model multiNODE 2150 Series Controller
- 2. M2150-DBU (20K cardholders)
- 3. M2150-8DBC
- 4. M2150 Network interface:
 - a. MN-NIC-4 (with 10baseT and 100baseT)
- 5. Wiegand interface module
 - a. WIM8

B. Cards & Readers

- 1. HID RP40 iClass

C. Electric Locks

- 1. HES model 5200 electric strikes
- 2. HES model 9600 electric strikes
- 3. Alarm Control Corporation model 600D electromagnetic locks

D. Request-to-Exit Devices

- 1. Kantech model TREX-LT passive infrareds

E. Power Supplies

1. Altronix AL600ULACM

F. Wiring

1. Network Connections
 - a. door controller to reader
 - b. door controller to electric lock
 - c. door controller to door status switch
 - d. door controller to request-to-exit device
2. DBU to power supply

PART 3 – EXECUTION

3.1 ACCEPTABLE INSTALLERS

- A. The system shall only be provided by Contractors who are factory authorized to install, service and maintain the system by the access control manufacturer.
- B. The Contractor must have been a factory authorized dealer with the proposed manufacturer for a period of at least two (2) years before the Bid Opening Date.
- C. The Contractor's installers and technicians must also be factory trained and certified to perform such tasks.

3.2 INSTALLATION

- A. The Contractor shall coordinate with the SCSO's IS Department for connecting to their network.
- B. The Contractor shall coordinate with the SCSO's locksmith if converting from mechanical to electric locks.
- C. The Contractor shall install the appropriate cable from the CPU to readers, door contacts, request-to-exit devices, and electric locks at each door and/or gate.
- D. The Contractor shall install the power supply(s) for electric locks in locations where they won't interfere with other operations.
- E. The Contractor shall also execute adequate testing of the system to insure proper operation.

3.3 WIRE AND CABLE

- A. Design, layout, size, and plan new wire and cable runs as required.
- B. All wire and cable from the processors to all devices at each door shall be "home-run" unless otherwise specified.
- C. All wire and cable, including any wire and cable that is existing and will be reused in the Work, shall be installed in conduit or surface metal raceway, except as follows:
- D. All wire and cable passing thru metalwork shall be sleeved by an approved grommet or bushing.
- E. Avoid splicing conductors. All splices shall be made in junction boxes (except at equipment). Splices shall be made with an approved crimp connection. Wire nuts shall not be used on any low-voltage wiring.
- F. Identify all wire and cable at terminations and at every junction box. Identification shall be made with an approved permanent label, Brady or equal.

3.4 WIRE AND CABLE TERMINATIONS

- A. Identify all inputs and outputs on terminal strips with permanent marking labels.
- B. Neatly dress and tie all wiring. The length of conductors within enclosures shall be sufficient to neatly train

the conductor to the terminal point with no excess. Run all wire and cable parallel or normal to walls, floors and ground.

C. Install connectors as required by equipment manufacturers.

D. Terminations shall be made so that there is no bare conductor at the terminal. The conductor insulation shall bear against the terminal or connector shoulder.

E. Do not obstruct equipment controls or indicators with wire or cable. Route wire and cable away from heat producing components such as resistors, regulators, and the like.

3.5 FIELD QUALITY CONTROL

A. Upon reaching Substantial Completion, perform a complete test and inspection of the system. If found to be installed and operating properly, notify SCSO of your readiness to perform the formal Test & Inspection of the complete system.

B. Submit the Record Drawings (as-builts) to SCSO for review prior to inspection.

C. During the formal Test & Inspection (Commissioning) of the system, have personnel available with tools and equipment to remove devices from their mounts to inspect wiring connections. Provide wiring diagrams and labeling charts to properly identify all wiring.

D. If corrections are needed, the Contractor will be provided with a Punch-List of all discrepancies. Perform the needed corrections in a timely fashion.

E. Notify SCSO when ready to perform a re-inspection of the installation.

3.6 INITIAL PROGRAMMING AND CONFIGURATION

A. Contractor shall provide initial programming and configuration of the security management system.

Programming shall include defining hardware, doors, monitor points, clearance codes, time codes, door groups, alarm groups, operating sequences, camera call-ups, and the like. Input of all program data shall be by Contractor. Contractor shall consult with Security Consultant and Owner to determine operating parameters.

B. Contractor shall develop and input system graphics, such as maps and standby screens. Owner shall provide floor plan drawings as the basis for the creation of maps. Development of maps shall include the creation of icons for all doors, monitor points, and tamper circuits. Owner shall provide floor plan drawings, in the form of AutoCAD .DWG or .DXF files, as the basis for the creation of maps.

C. Owner, with the cooperation and assistance of Contractor, will input the cardholder data for each access card.

D. Contractor shall maintain hard copy worksheets which fully document the system program and configuration. Worksheets shall be kept up to date on a daily basis by Contractor until final Acceptance by Owner. Worksheets shall be subject to inspection and approval by Owner. Provide final copies to Owner prior to Project Close-out.

E. Contractor shall maintain a complete, up-to-date magnetic tape backup of the system configuration and cardholder database. Backup shall be maintained throughout programming period until final Acceptance by Owner. Submit back-up tapes to Owner upon Final Acceptance.

END OF SECTION

TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

DIVISION 2 – SITE WORK

31 00 00	SITE WORK
31 05 00	SITE PREPARATION
31 22 00	EARTHWORK
31 23 16	EXCAVATION, TRENCHING AND BACKFILLING

SECTION 31 00 00

SITE WORK

PART 1 - GENERAL

1.01 DESCRIPTION

- A. These general site work requirements apply to all site work operations.

1.02 QUALITY ASSURANCE

- A. Comply with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials.
- B. Obtain and pay for all required inspections, permits, and fees. Provide notices required by governmental authorities.
- C. The Contractor is responsible for securing the services and paying for an independent testing laboratory to provide materials and quality control testing to comply with the construction documents.

1.03 RELATED WORK

- 1. Section 31 22 00: Earthwork.

1.04 PROJECT CONDITIONS

- A. Erosion control measures will be the responsibility of the Contractor. Law suits or off-project damage due to lack of proper erosion control measures or maintenance of such will be the sole responsibility of the Contractor. The Contractor shall identify the erosion control subcontractor and sign the Notice of Intent, as required by the Tennessee Department of Environmental Quality, on the same date the Construction Contract is signed.
- B. Locate and identify existing underground and overhead services and utilities within contract limit work areas. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations at Contractor's expense.
- C. Arrange for disconnection, disconnect and seal or cap all utilities and services designated to be removed before start of site work operations. Perform all work in accordance with the requirements MLG&W or agency involved.
- D. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, MLG&W immediately to obtain procedure directions. Cooperate with the MLG&W in maintaining active services in operation.

- E. Locate, protect, and maintain benchmarks, monuments, control points and project engineering reference points. Re-establish disturbed or destroyed items at Contractor's expense.
- F. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks, and other adjacent facilities.
- G. Obtain City of Memphis written permission when required to close or obstruct street, walks and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways when required by governing authorities, and construct to all City of Memphis Specifications.
- H. Control dust caused by the work. Dampen surfaces as required. Comply with pollution control regulations of TDEC. The Owner reserves the right to require a water truck be kept in operation at the site during all grading operations.
- I. Protect existing buildings, paving, and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items at Contractors expense.
- J. Protect and maintain street lights, utility poles and services, traffic signal control boxes, curb boxes, valves and other services, except items designated for removal. Remove or coordinate the removal of traffic signs, etc., with the City of Memphis. Provide for temporary relocation when required to maintain facilities and services in operation during construction work.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment: As selected by Contractor, except as indicated.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.
- B. Consult the records and drawings of adjacent work and of existing services and utilities which may affect site work operation.
- C. It is the Contractor's responsibility to review and document site conditions prior to construction. All disturbed areas will be returned to existing conditions.
- D. Obtain written permission for all offsite work from applicable property owners.

END OF SECTION

SECTION 31 05 00

SITE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Perform site preparation work as shown and specified. The work includes:
 - 1. Installation of erosion and sedimentation control measures.
 - 2. Stripping and stockpiling topsoil.
 - 3. Clearing, removal, and disposal of all debris, structures, and abandoned pipe lines.
- B. Related Work:
 - 1. Section 31 00 00: Site Work
 - 2. Section 31 22 00: Earthwork

1.02 QUALITY ASSURANCE

- A. Comply with Section 31 00 00 requirements.

1.03 PROJECT CONDITIONS

- A. Perform site preparation work before commencing site construction.
- B. Locate, protect and maintain active utilities and site improvements to remain.
- C. Provide necessary barricades, coverings, and protection to prevent damage to existing improvements indicated to remain.
- D. Contact Owner if damage to adjacent properties is anticipated. Do not proceed in such areas until permission to continue has been received in writing.

PART - 2 PRODUCTS

2.01 MATERIALS

- A. Materials and equipment: As selected by the Contractor, except as indicated.

PART 3 - EXECUTION

3.01 CLEARING

- A. Locate and identify improvements indicated to remain.
- B. Clear selective areas within property boundary as illustrated on the plans and as required for site access and execution of the work. No clearing within any existing landscape easements.
- C. Remove trees, plant undergrowth, other vegetation, and debris, except items indicated to remain. Strip weeds and grass.
 - 1. Fell trees in a manner to prevent injury to adjacent facilities and to trees scheduled to remain.
 - 2. Remove stumps and roots to a clear depth of 36" below proposed subgrades. Remove stumps and roots to their full depth within 5'-0" of underground structures, utility lines, footings and paved areas.
- D. Remove all clear and grubbed debris from the Owner's property.

3.02 STRIPPING TOPSOIL

- A. Strip topsoil to its full depth at building areas, and all areas to be re-graded, resurfaced, or paved within contract limit work area.
- B. Stockpile topsoil to a location acceptable to the Owner, for use in finish grading and preparation of lawn areas.
 - 1. After all grading is complete, mounded topsoil shall be leveled and spread evenly to the final contours indicated on the plans.
 - 2. Stockpiled topsoil shall be free from trash, brush, stones over 3" diameter, and other extraneous matter.
 - 3. Grade and slope stockpiles for proper drainage and to prevent erosion.
 - 4. Excess topsoil shall be spread over the site at locations directed by the Owner.
- C. Protect all areas that are not to be resurfaced or re-graded, and adjacent areas outside of the contract limits from damage due to site preparation work, including damage due to soil erosion from graded areas. Install soil erosion and sedimentation control measures accordingly.

3.03 SITE IMPROVEMENTS

- A. Existing utilities:
 - 1. Information on the drawings relating to existing utility lines and services is from the best sources presently available. All such information is furnished only for information and is not guaranteed. Excavate test pits as required to determine exact locations of existing utilities.
 - 2. Where the MLG&W has no jurisdiction, perform work and provide necessary materials to disconnect or relocate existing utilities as indicated. Record existing utility termination points before disconnecting.
 - 3. Contact MLG&W if conflict with existing utilities exists. Proceed with work in immediate area when written notice to proceed is acquired from Owner.
- B. Remove, temporarily relocate during construction and reinstall in final location, street signs and other designated items if road work is to be performed. Coordinate the work with City of Memphis. Comply with all requirements concerning temporary installation and permanent reinstallation.

3.04 DISPOSAL OF WASTE MATERIALS

- A. Stockpile, haul from site, and legally dispose of waste materials and debris. Accumulation is not permitted.
- B. Maintain disposal routes clear, clean, and free of debris.

3.05 CLEANING

- A. Upon completion of site preparation work, clean areas within contract limits (and all areas disturbed by Contractor's operations), remove tools, and equipment. Provide site clear, clean, and free of materials and debris and suitable for site work operations.

END OF SECTION

SECTION 31 22 00

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Perform earthwork as shown and specified. The work includes:
 - 1. Site grading and filling to indicated elevations, profiles, contours, and as shown in the typical sections.
 - 2. Finish grading.
 - 3. Subgrade compaction.

1.02 QUALITY ASSURANCE

- A. Testing and Inspection: Performed by a qualified independent testing laboratory, under the supervision of a registered professional engineer, specializing in soils engineering. Testing laboratory shall be hired by the Contractor but shall meet the approval of the Engineer.
- B. The Contractor to coordinate with representative of testing firm/laboratory.
- C. Materials and methods of construction shall comply with the following standards:
 - 1. City of Memphis Standard Specifications and TDOT Road & Bridge Specifications 2006.
 - 2. American Society for Testing and Materials, (ASTM).
 - 3. American Association of State Highway and Transportation Officials, (AASHTO).

1.03 SUBMITTALS

- A. Provide samples of materials proposed for use. Forward samples to testing laboratory for testing as directed by the Soils Engineer.
- B. Submit reports to the Owner for testing and inspection of the following:
 - 1. Fill and backfill materials.
 - 2. Subgrade surfaces.
 - 3. Compaction operations and compaction testing.

4. Concrete form work.
- C. Provide site grading record drawings.
1. Visibly mark drawing to record actual as-built construction.
 2. Indicate horizontal and vertical locations of finish grades.

1.04 PROJECT CONDITIONS

- A. Known underground and surface utility lines are indicated on the drawings. Their exact location may not be as indicated on the drawings. Contractor shall contact MLG&W to locate utilities and make all repairs to utilities damaged by his operations.
- B. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods, as required to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks.
- C. Underpin adjacent structure(s), including utility service lines, which may be damaged by excavation operations.
- D. Promptly repair damage to adjacent facilities caused by earthwork operations. Cost of repair at Contractor's expense.
- E. Promptly notify the Engineer of unexpected sub-surface conditions.
- F. Grade excavations to prevent surface water draining into and ponding in excavated areas.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All on-site and offsite fill material is subject to testing and inspection per ASTM D 698 to determine proper moisture-density relationship.
- B. On site fill materials – This shall be classified materials secured from project excavation and grading operations and are composed of: Inert subsoil material free of topsoil, organic contaminated soil, rubbish, debris, rock fragments greater than 3" diameter and not exceeding 1" within one foot of the finished grade and meeting the following requirements; or suitable off-site borrow.
- C. Off-site borrow fill material shall have the following properties:
 1. Plastic index less than 25.
 2. Maximum liquid limit of less than 45.

3. Utilize off-site borrow fill material, when fill material resulting from on site operations is of insufficient quantity or quality to complete the work.
 4. Re-grade and restore areas used for on-site fill as shown on the plans.
 5. Proposed fill material shall be classified, tested, and a laboratory report issued prior to use on the project.
- D. Granular fill: At the Contractor's option the following granular material may be used as fill.
1. AASHTO M43, #10 crushed stone or gravel.
- E. Topsoil: Natural, friable, fertile soil characteristic of productive soil in the vicinity, reasonably free of stones, clay lumps, roots, and other foreign matter. Topsoil taken from excavation operations may be used if acceptable to the Landscape Architect.
1. Import approved, suitable topsoil as required to complete the work.
 2. Proposed topsoil material shall be acceptable to the Landscape Architect.
 3. Topsoil shall be placed in turfing and planting areas only.
- F. Other materials required for proper completion of work: As selected by Contractor and acceptable to Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Establish extent of grading and excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels, and elevations.
- B. Do not cover or enclose work of this Section before obtaining required inspections, tests, approvals, and location recording.
- C. Place soil erosion control fencing and other erosion control devices as per the details indicated on the plans, prior to all construction.

3.02 EXISTING UTILITIES

- A. Before starting grading and excavation, establish the location and extent of underground and overhead utilities in the work area. Exercise care to protect existing utilities during earthwork operations. Perform excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as the work progresses. Notify the Owner of any utilities that require relocation or extension to perform the work that is not otherwise depicted on the plans. Utilities requiring relocations or extensions not included in the contract documents will be addressed by a Change Order.

- B. Maintain and protect, as required, existing utility lines to remain which pass through the work area. Contractor responsible for costs incurred for this work, except as covered by the MLG&W.
- C. Protect active utility services uncovered by excavation.
- D. In coordination with the utility company, remove abandoned utility service lines from areas of excavation. Cap, plug or seal abandoned lines and identify termination points at grade level with markers.
- E. Accurately locate and record abandoned and active utility lines rerouted or extended on project record documents. Existing utilities located in areas other than depicted on the construction documents will be shown in their as built location.

3.03 SITE GRADING

- A. Perform grading within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide subgrade surfaces parallel to finished surface grades. Provide uniform levels and slopes between new elevations and existing grades, unless otherwise depicted on the construction documents.
- B. Grade surfaces to assure areas drain away from structures and pavement (as indicated on the drawings) and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes and as follows:
 - 1. Rough grading: Plus or minus 0.10 ft. subgrade tolerance.
 - 2. Provide subgrade surface free of exposed boulders or stones exceeding 3" in greatest dimension in paved areas; 2" lawn and planting areas.
 - 3. Lawn and planting areas: Allow for 4" average depth of topsoil at lawn areas, and 12" depth at planting areas, except as otherwise indicated on the drawings.
 - 4. Paved areas: Shape surface of subgrade to line, grade, and cross-section indicated. Provide compacted subgrade suitable to receive paving base materials. Subgrade tolerance plus 0, minus 1/2".
 - 5. Drainage ditches: Grade to profiles, contours and elevations indicated.
- C. Existing slopes should be cut back to firm, undisturbed soils and all loose and disturbed soils should be removed. At areas of erosion (existing drop inlets), the affected areas should be removed and replaced with fill constructed in accordance to the Geotechnical Report.

3.04 EXCAVATING

- A. Excavate for curbs, planting areas, walks, basements, and paving to cross-sections, elevations, and grades indicated. Allow for pavement and walk sections where indicated, and dimensions shown on the plans.

- B. Earth excavation shall include the satisfactory removal of all materials encountered, including topsoil, paving concrete walks, curb and gutter, and undercut regardless of the nature of the materials, the condition of the materials at the time they are excavated, or the manner in which they were excavated. Separate different material encountered for disposal. Stockpile topsoil and replace it in areas of new turfing. Remove all unsuitable material including pavement and undercut material from the project site. Excess material shall be graded on the site in areas shown on the construction documents, or as directed by the Owner.
- C. Undercut excavation: It will be the Contractor's responsibility to perform compaction efforts on the top 24" of the existing subgrade prior to authorization for undercutting. Material that is too wet, or too dry, but otherwise suitable shall be brought to within $\pm 2\%$ of optimum moisture content, and recompact in 8" maximum loose lifts at Contractor's expense. Material determined to be unsuitable by the Soils Engineer shall be undercut to the depth authorized by the Soils Engineer, and to the limits approved by the Owner. Backfill shall be with materials, and methods specified by the Soils Engineer. Undercut and backfill shall be paid for at unit prices stipulated in the bid form. Only undercut authorized by the Soils Engineer will be eligible for payment.
- D. Shore, sheet, or brace excavations as required to maintain them secure. Remove shoring and bracing as backfilling progresses, when banks are safe against caving.

3.05 SITE DRAINAGE AND UTILITIES EXCAVATING AND BACKFILLING

- A. Performed under Site Drainage, Part 24 (City of Memphis Specifications).

3.06 DRAINAGE

- A. Provide necessary pumps and drainage lines and maintain excavations, including footings and pits, free from water, ice and snow during excavating and subsequent work operations.
- B. Provide positive drainage of the working area and surrounding areas such that runoff is directed into drainage swales and away from roads and future building locations at all times. Provide erosion control as depicted on the construction documents to prevent silt from leaving the site.

3.07 FILLING, BACKFILLING, AND COMPACTING

- A. Obtain inspection and approval of subgrade surfaces by Soils Engineer prior to filling operations. Scarify, dry, and compact soft and wet areas or add water to bring material to $\pm 2\%$ of optimum moisture content. Take corrective measures before placing fill materials.
 - 1. Topsoil not permitted as fill or backfill material.
- B. Soil stabilization: When exposed subgrade surfaces become spongy during construction operations and can not be remediated as per paragraph 3.04 C, soil stabilization may be required. Stabilize subgrade materials, as recommended by the Soils Engineer, only within the limits approved by the Owner. Obtain Engineer's written authorization before performing soil stabilization work. Soil Stabilization will be considered a Change Order item, and will be performed only after written agreement between the Owner and the contractor.

- C. Spread approved fill material uniformly in horizontal layers not greater than 8" of loose thickness over entire fill area.
1. Lift thickness requirements may be modified by Soil Engineer to suit equipment and materials or other conditions when required to assure satisfactory compaction.
 2. Moisture-condition fill material by aerating or watering and thoroughly mix materials to obtain optimum moisture content permitting proper compaction.
 3. Place and compact each layer of fill to 95% Standard Proctor density in areas to receive buildings, sidewalks, pavement, and extending 5'-0" around the perimeter at such areas. The top 12" of areas to receive landscaping or turf shall be compacted to 95% Standard Proctor before placing additional fill material. Repeat filling until proposed grade, profile, detail, or contour is attained.
 4. Suspend fill operations when satisfactory results cannot be obtained because of environmental or other unsatisfactory site conditions. Do not use muddy or frozen fill materials. Do not place fill material on muddy or frozen subgrade surface.
 5. Maintain surface conditions which permit adequate drainage of rainwater and prevent ponding of surface water in pockets.
 6. When fill placement is interrupted by rain, remove wet surface materials or permit to dry before placing additional fill material.
- D. Place backfill materials in uniform layers not greater than 8" loose thickness over entire backfill area.
1. Use hand tampers or vibrating compactors at drainage lines and structures, retaining walls, and similar locations. Do not use large rolling equipment adjacent to foundation walls and retaining walls.
 2. Do not backfill against retaining walls until walls for bearing surfaces have reached design strength or are properly braced, and backfilling operations approved. Provide clean backfill materials, except where granular materials are indicated. Compact in maximum 8" layers.
- E. Fill all areas of settlement to proper grade before subsequent construction operations are performed.
- F. Compaction:
1. Provide compaction control for all fill and backfill as specified by the Soils Testing Engineer.
 2. Fill required to support pavements, and backfill around should be compacted to a dry density of not less than 95% of maximum dry density as established by ASTM D 698 specifications. Refer to structural specifications for compaction understructures. Extend compaction at least 1'-0" beyond paving.

3. Fill required to support turfing and landscaped areas should be compacted to a dry density of not less than 85% of maximum dry density as established by ASTM D 698 specifications.
4. Water settling, puddling, and jetting of fill and backfill materials as a compaction method are not acceptable.
5. Maintain moisture content of materials, during compaction operations within $\pm 2\%$ of optimum moisture content to obtain specified compaction density.
6. Provide adequate equipment to achieve consistent and uniform compaction of fill and backfill materials.
7. The top 24" of subgrade material which is too wet or too dry but otherwise suitable, shall be aerated or moistened as required to be brought to the optimum moisture content.

3.08 FINISH GRADING

- A. Uniformly distribute and spread stockpiled topsoil. Provide 4" average depth at lawn areas. Provide additional imported topsoil as required to complete the work. Use loose, dry topsoil. Do not use frozen or muddy topsoil. Place during dry weather.
- B. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.
- C. Remove stones, roots, weeds, and debris while spreading topsoil materials. Rake surface clean of stones 1" or larger in any dimension and all debris. Provide surfaces suitable for soil preparation provided under lawn and planting work.
- D. Manually install topsoil at trees to remain. Avoid damage to root systems.
- E. Maintenance:
 1. Protect finished graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and damaged areas.
 2. Where completed areas are disturbed by construction operations or adverse weather, scarify, re-shape, and compact to required density.

3.09 FIELD QUALITY CONTROL

- A. Provide field quality control soils testing and inspection during earthwork operations.
- B. Contractor shall provide adequate notice, cooperate with, provide access to the work, obtain samples, and assist testing agency and their representatives in execution of their function.

- C. Fill materials: Test proposed materials to verify suitability for use, gradation of material, moisture-density relation by ASTM D 698 Standard Proctor Method, Atterberg Limits, and percent of organic materials.
- D. Subgrade surfaces: Based on visual examination at the site, provide compaction tests as required to verify subgrade surfaces are adequate and meet or exceed specified values.
 - 1. Paved areas: Make at least 1 test for each 2,500 sq. ft. of paved area.
- E. Compaction operations: Provide full-time inspection and testing during filling and compaction operations in areas to receive pavement or slabs. Test each lift of fill to verify compaction meets specified requirements. Provide periodic inspection and testing during site area grading and compaction operations.
 - 1. Paved areas: Make at least 1 test for each 2,500 sq. ft. per lift of paved area.
- F. When during progress of work, field tests indicate that installed compacted materials do not meet specified requirements, provide additional compaction until specified density is achieved, or remove and replace defective materials as directed by the Soils Engineer. Cost of additional labor, materials, and testing to attain specified density at Contractor's expense.

3.10 CLEANING

- A. Upon completion of earthwork operations, clean areas within contract limits and the public R.O.W., remove tools, erosion control fencing, and equipment. Provide site clear, clean, free of debris, and suitable for site work operations.

END OF SECTION

SECTION 31 23 16**EXCAVATION, TRENCHING AND BACKFILLING****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This section covers the excavation, trenching, and backfilling for all utility systems, including pipelines, storm sewers, and service laterals, up to the point of connection or approximately five feet outside the building.
- B. It shall be the Contractor's responsibility to keep the work free of water either from surface sources or from underground sources or from both. The selection of equipment and method of removal or water shall be the sole responsibility of the Contractor.

1.02 APPLICABLE PUBLICATION

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic description only.

ASTM A/A36M-88b	Specifications for the Structural Steel
ASTM A 139/A139M-88	Specification for Electric-Fusion (Arc) Welded Steel Pipe
ASTM A502-83a	Specification for Steel Structural Rivets
ASTM D 698-78	Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures
ASTM D 1557-78	Test Methods for Moisture-Density Relation of Soils and Soil-Aggregate Mixture

1.03 DENSITY TESTS

Tests shall be performed by an independent laboratory selected by the Contractor, and paid for by the Contractor. Test results shall be submitted to the Engineer and Owner for review.

All trenches 12 inches or wider, as measured at the top, that are within roadways, or roadway right-of-ways, parking areas, and areas to be paved shall be tested for conformance to compaction requirements as specified in the EARTHWORK section of these specifications.

- A. These trenches shall be backfilled and compacted to their full depth.
- B. Tests shall be made every 100 feet along the pipeline, or a minimum of one test, and to 4 foot vertical intervals throughout the backfill. Tests taken in 4 foot intervals shall be staggered.

1.04 UTILITIES

Active utilities shall be protected from damage and removed or relocated only as indicated or specified. Where active utilities are encountered but are not shown on drawings, the Engineer shall be advised.

The Contractor shall notify Tennessee One Call & MLG&W for actual location of utilities. The contractor is responsible for locating and protecting all utilities. Utilities shown on the drawings are based on the available information.

The Contractor shall maintain utility service to the existing building throughout construction. Any utility interruption must be approved by and coordinated with MLG&W.

1.05 MACHINERY AND EQUIPMENT

Movement of construction machinery and equipment over pipes during construction shall be at the contractor's risk. The contractor shall repair or replace pipe that has been displaced or damaged.

PART 2 - MATERIALS

2.01 WOOD SHEETING

Construction wood sheeting may be new or used lumber of a species or grade suitable for the proposed use. The contractor shall retain full responsibility for the structural integrity and adequacy of the sheeting.

2.02 STEEL SHEET PILING

If steel sheet piling is used, it shall conform to ASTM A328 and consist of rolled sections of the continuous interlocking type. Minimum thickness of the web and flange metal shall be 3/8 inch, unless otherwise approved or specified. Rivet steel and structural material as fabricated connections and accessories shall conform to requirements of ASTM A502 and ASTM A36. All steel sheet piles shall be furnished with standard pulling holes located approximately four inches below the top of the pile.

PART 3 - INSTALLATION

3.01 EXCAVATION

The Contractor shall perform all excavation to the depths shown on the drawings or as specified. During excavation, materials suitable for backfilling shall be piled a sufficient distance from the banks of the excavation to avoid overloading and to prevent slides and cave-ins. Excavated materials not suitable or required for fill or back-fill shall be removed from the site. All excavation shall be made by open cut. No tunneling shall be done unless shown on the drawings.

Excavation shall not be carried below the designated level except where special bedding is specified or shown on the drawings. Excess excavation below the designated level shall be backfilled with sand or crushed stone and tamped. Excess excavation for manholes and other structures shall be filled with crushed stone or concrete to the required elevation.

Trenches shall be only of sufficient width to provide a free working space on each side of the pipe. To prevent excess pressure on the pipe, the maximum width of pipe trench at the top of the pipe shall not be greater than two feet more than the pipe diameter. If this maximum width is exceeded, the Contractor shall provide concrete bedding at no additional cost to Owner. The top portion of the trenches may be excavated with sloping or vertical sides to any width which will not damage adjoining structures, roadways, pavements, utilities, or private property.

The trench bottom shall be made to conform as near as possible to the shape of the lower third of the pipe. Excavation shall be made for joints of all pipes, and shall be of sufficient depth to permit access to the joint for construction and inspection. In no case will the joints be used to support the body of the pipe.

Unstable soil shall be removed and replaced with gravel, which shall be tamped.

Ground adjacent to all excavations shall be graded to prevent inflow of water.

The excavation of the trench shall not advance more than one hundred feet (100') ahead of the completed pipe work.

The Contractor shall remove any water accumulated during excavation regardless of source.

3.02 SHEETING AND SHORING

All excavations shall be properly shored, sheeted, and braced or cut back at the proper slope to furnish safe working conditions, to prevent shifting of material, to prevent damage to structures or other work, and to avoid delay to the work, all in compliance with the U.S. Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (PL91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL91-54). Bracing shall be so arranged as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.

Timber sheet piles shall be sharpened in a manner which will assist in holding them in true alignment during driving and the tops shall be protected with caps or other means to prevent damage by the driving equipment. Any pieces damaged or split below the point of cutoff shall be removed and replaced.

Sheet piles shall be carefully located and driven straight and true to the desired elevation with secure interlocking for the entire length. Damaged piling or one with faulty alignment shall be withdrawn and new piling driven properly in its place. Jetting will not be permitted. Excavation shall not be carried in advance of the steel sheet piling.

In general, sheeting for pipelines shall not be driven below the elevation of the top of the pipe. If it is necessary to drive sheeting below that elevation, the sheeting shall be cut off at the top of the pipe and the remaining sheeting left in place.

Sheeting and bracing shall be removed as the excavation is refilled in such a manner as to avoid caving in of areas or structures. Voids left by withdrawal of the sheeting shall be carefully filled by ramming.

3.03 BACKFILLING

Trenches shall be backfilled with earth backfill materials placed evenly around and on both sides of the pipe in six-inch (6") maximum layers, and tamped until pipe has cover of not less than twelve inches (12") above the top of pipe. The remaining backfill shall be carried on simultaneously on both sides of the trench in such a manner to avoid side pressures. Water settling shall not be permitted. Any trenches where settlement occurs shall be reopened, refilled, and compacted, with the surface restored to the specified grade and compaction, and smoothed off.

Prior to backfilling at manholes and other accessories, all forms, trash, and debris shall be removed. Backfill material shall be symmetrical on all sides in 8-inch maximum layers. Each layer shall be moisture conditioned, if necessary, and compacted with tampers.

Where pipe is not structurally supported, unstable material shall be removed. A pipe bed and embankment shall be constructed of gravel or crushed stone and compacted. The material shall be placed symmetrically on each side of pipe in 6-inch maximum layers and compacted. Layers shall be placed and compacted until a berm is formed at least one pipe diameter on each side of pipe and 12-inches minimum fill over pipe.

Prior to final acceptance of the installations, the Contractor shall refill all sunken trenches and excavations to final grade.

Earth backfill shall be free of stones greater than 4 inches in any dimension, construction debris, topsoil, and organics. Acceptable backfill material may be from excavation or borrowed.

3.04 SUBSURFACE OBSTRUCTIONS

While excavating, backfilling, and laying pipe, care must be taken not to remove, disturb, or injure any existing water, sewer, or gas pipes, or other conduits or structures. If necessary, the Contractor, shall sling, shore up and maintain such structures in operation, and within a reasonable time shall repair any damage done to them. Before final acceptance of the work, he shall return all such structures to original condition.

The contractor shall give a minimum of 24 hours notice to the MLG&W of his intention of removing or disturbing any pipes, conduits, etc., and shall abide by their regulations governing such work. In the event that any subsurface structure become broken or damaged in the course of the work, the Contractor shall immediately notify the proper authorities, and shall be responsible for all damage to persons or property caused by such damage.

When pipes or conduits providing services to adjoining buildings are broken during the progress of the work, the contractor shall repair them at once, or if repaired by the MLG&W, shall pay MLG&W for any charges for having such repairs made.

Neither Owner nor the Engineer will be liable for any claim made by the Contractor based on underground obstructions being different to that indicated in these contract documents or plans.

3.05 REMOVING AND REPLACING PAVEMENT

In areas where it becomes necessary to remove the existing pavement in order to install the pipe lines and appurtenances, the Contractor shall perform the work in the following manner:

- A. Before removing any pavement, the pavement shall be marked for cuts neatly paralleling the pipe lines and spaced the width of the trench.
- B. The pavement shall be saw-cut along the marked lines. No pavement shall be pulled out by machine until completely saw-cut and separated along the marked cuts.
- C. The pavement adjacent to pipe line trenches must not be disturbed or damaged. If the pavement is disturbed or damaged, due to caving ditch banks, or indiscriminate use of construction machinery, the contractor shall remove and replace the damaged pavement at his expense.
- D. Where pipelines are parallel to and under sidewalks, the Contractor shall remove and replace the sidewalk for its full width up to six feet.
- E. The Contractor shall remove and replace or tunnel under any curb encountered.

Restoration of pavement which is under the jurisdiction of a government agency, such as highways, or county roads, shall be done in accordance with that agency's requirements. Restoration of pavement which is not under the jurisdiction of a government agency shall be done in the following manner:

1. Pavement restoration shall follow closely the backfilling operation. If in the opinion of the engineer the repaving work is allowed to lay, the Engineer shall order the work stopped on other section of the contract until the pavement restoration is completed within acceptable limits.
2. Prior to replacing any pavement the Contractor shall make a final cut not less than nine inches back from the edge of the damaged pavement. This cut shall be made using a rotary saw and the pavement removed using jack hammers. This shall be done in order to provide a firm bench for placement of the new pavement. Pavement replacement shall be done as detailed on the drawings and shall be replaced with the same type materials and to the same dimensions as existing.
3. Should the replaced pavement fail or settle within one year after the work, the Contractor shall promptly repair or restore such pavement at his own expense.

3.06 PIPE CASING

Where pipelines cross under railroads, highways, or other areas which require casing the Contractor shall furnish all material, equipment, and labor required to perform the following work:

- A. Materials: The steel casing pipe shall be Schedule 30 steel pipe manufactured from steel conforming to ASTM Designation A 139, Grade B. Size and thickness shall be as follows:

UNDER RAILROADS

<u>Carrier Pipe Diameter (Inches)</u>	<u>Casing Diameter (Inches)</u>	<u>Wall Thickness (Inches)</u>
6	14	0.250
8	18	0.250
10	20	0.281
12	22	0.312
14	24	0.344
16	30	0.406
18	30	0.406

UNDER HIGHWAYS

<u>Carrier Pipe Diameter (Inches)</u>	<u>Casing Diameter (Inches)</u>	<u>Wall Thickness (Inches)</u>
6	12	0.250
8	16	0.250
10	16	0.250
12	18	0.250
14	22	0.250
16	24	0.250
18	30	0.312

The outside of the casing pipe shall be primed and coated with a hot coal tar enamel a minimum of 3/32-inches thick. Only new primed and coated pipe shall be used. The steel pipe casing shall be installed by the dry boring method. The hole shall be bored and cased through the soil by a cutting head on a continuous auger mounted inside the casing pipe. The boring of the hole and installation of the casing pipe shall be simultaneous. Lengths of casing pipe shall be fully welded to the preceding section. After the boring and installation of the casing is complete, a cleaning plug shall be installed on the rig and the casing cleaned.

- B. After installation of the casing, the carrier pipe shall be installed in accordance with the requirements of the regulatory agency. The ends of the casing shall be sealed with concrete and a 2-inch diameter weep hole shall be provided at each end.

END OF SECTION