

**PROJECT MANUAL**  
*for*  
**CREMATORIUM ADDITION**  
**Animal Village**

*4500 Kramer Street  
Little Rock, Arkansas*

**City of Little Rock**



City of Little Rock Bid # 15128

Architect Engineer Project No. 2014-205-10

*January 30, 2015*



**cromwell architects engineers, inc.**

101 s. spring street, little rock, arkansas 72201-2490  
t: 501-372-2900 f: 501-372-0482 www.cromwell.com cromwell@cromwell.com

**This page was intentionally left blank for duplex printing.**

SECTION 00 01 05

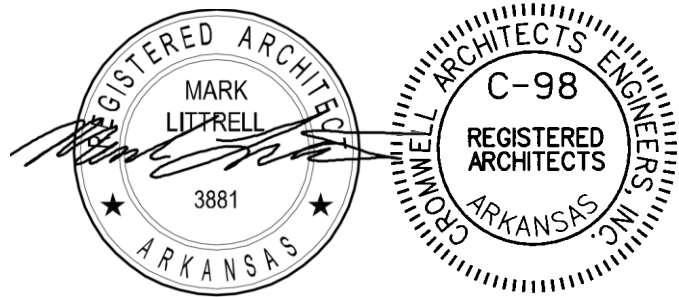
CERTIFICATIONS

I hereby certify that the architectural portions of work included in these plans and specifications, except as otherwise indicated by other registered professionals, have been prepared by me or under my direct supervision, and that I have coordinated the architectural portions with those portions sealed by other registered professionals. I further certify that to the best of my knowledge this portion of the plans and specifications are as required by law and in compliance with the Arkansas Fire Prevention Code for the State of Arkansas and with the Arkansas Code For Energy Conservation In New Building Construction.

Mark Littrell, AIA  
Architect

CROMWELL ARCHITECTS  
ENGINEERS, INC.  
Architects Engineers  
101 S. Spring Street  
Little Rock, Arkansas

30-Jan-2015  
Date

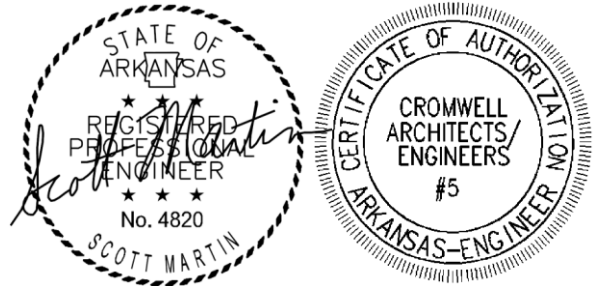


I hereby certify that the civil portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision. I further certify that to the best of my knowledge this portion of the plans and specifications are as required by law and in compliance with the Arkansas Fire Prevention Code for the State of Arkansas.

Scott Martin, PE  
Civil Engineer

CROMWELL ARCHITECTS  
ENGINEERS, INC.  
Architects Engineers  
101 S. Spring Street  
Little Rock, Arkansas

30-Jan-2015  
Date

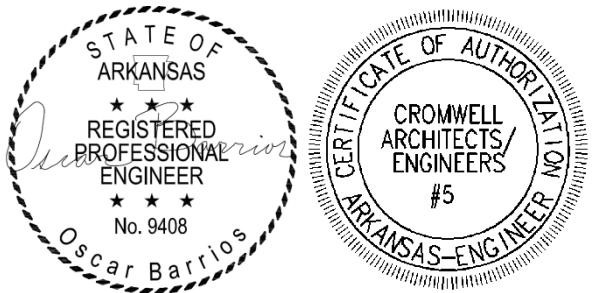


I hereby certify that the structural portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision. I further certify that to the best of my knowledge this portion of the plans and specifications are as required by law and in compliance with the Arkansas Fire Prevention Code for the State of Arkansas. I further certify that to the best of my knowledge the structural elements are designed as required by law and in compliance with the requirements of Arkansas Earthquake Resistant Design for Public Structures (ASA 12-80-101 et seq.) for and the latest edition of the International Building Code with revisions.

Oscar Barrios, PE  
Structural Engineer

CROMWELL ARCHITECTS  
ENGINEERS, INC.  
Architects Engineers  
101 S. Spring Street  
Little Rock, Arkansas

30-Jan-2015  
Date

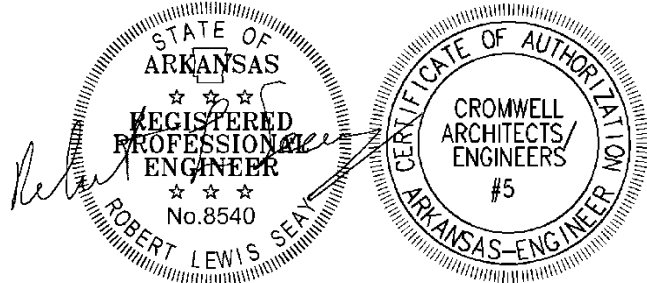


I hereby certify that the mechanical portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision. I further certify that to the best of my knowledge this portion of the plans and specifications are as required by law and in compliance with the Arkansas Fire Prevention Code for the State of Arkansas and with the Arkansas Code For Energy Conservation In New Building Construction.

Robert L. Seay, PE, Mechanical Engineer  
Principal

CROMWELL ARCHITECTS  
ENGINEERS, INC.  
Architects Engineers  
101 S. Spring Street  
Little Rock, Arkansas

30-Jan-2015  
Date

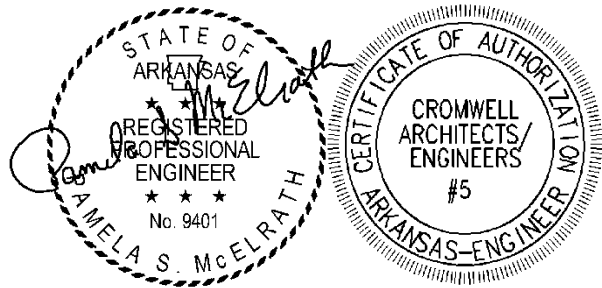


I hereby certify that the electrical portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision. I further certify that to the best of my knowledge this portion of the plans and specifications are as required by law and in compliance with the Arkansas Fire Prevention Code for the State of Arkansas.

Pamela S. McElrath, PE  
Electrical Engineer

CROMWELL ARCHITECTS  
ENGINEERS, INC.  
Architects Engineers  
101 S. Spring Street  
Little Rock, Arkansas

30-Jan-2015  
Date



**SECTION 00 01 10**  
**TABLE OF CONTENTS**

**PROCUREMENT AND CONTRACTING REQUIREMENTS**

**DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS**

- 00 01 05 - Certifications
- 00 01 10 - Table of Contents
- 00 11 00 - Notice To Bidders
- 00 21 13 - Instructions to Bidders
  - AIA Document A701-1997 Instruction to Bidders
- 00 41 00 - Bid Proposal Form
- 00 52 00 - Agreement Form
  - CoLR Construction Contract Form
- 00 72 00 - General Conditions
  - CoLR General Conditions Form
- 00 73 43 - Wage Rates Requirements
  - Prevailing Wage Determination 14-385
  - Form ARK PW-2

**SPECIFICATIONS**

**DIVISION 01 -- GENERAL REQUIREMENTS**

- 01 10 00 - Summary
- 01 20 00 - Price and Payment Procedures
- 01 30 00 - Administrative Requirements
  - AIA Document G716-2004 Request for Information.
- 01 32 16 - Construction Progress Schedule
- 01 33 00 - Submittal Procedures
- 01 45 33 - Special Inspections
  - Statement of Special Inspections
  - Statement of SI Requirements for Seismic Resistance
  - Statement of SI Requirements for Tornado Resistance
  - Schedule of Special Inspections
  - Final Report of Special Inspections
  - Contractor Statement of Responsibility
  - Fabricator Certificate of Compliance
  - Minimum Qualifications Table
  - Special Inspection Daily Report
  - Special Inspection Discrepancy Notice
- 01 57 13 - Temporary Erosion and Sediment Control
- 01 60 00 - Product Requirements
  - 01 60 01 - Substitution Request Form
- 01 70 00 - Execution and Closeout Requirements
- 01 78 00 - Closeout Submittals
- 01 79 00 - Demonstration and Training

**DIVISION 02 -- EXISTING CONDITIONS**

- 02 41 00 - Demolition

**DIVISION 03 -- CONCRETE**

03 30 00 - Cast-in-Place Concrete

**DIVISION 04 -- MASONRY (NOT USED)**

**DIVISION 05 -- METALS**

05 12 00 - Structural Steel Framing

05 31 00 - Steel Decking

**DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES**

06 10 00 - Rough Carpentry

06 41 00 - Architectural Wood Casework

**DIVISION 07 -- THERMAL AND MOISTURE PROTECTION**

07 25 00 - Weather Barriers

07 41 13 - Metal Roof Panels

07 46 33 - Plastic Siding

07 46 46 - Fiber Cement Siding

**DIVISION 08 -- OPENINGS**

08 11 13 - Hollow Metal Doors and Frames

08 14 16 - Flush Wood Doors

08 71 00 - Door Hardware

**DIVISION 09 -- FINISHES**

09 21 16 - Gypsum Board Assemblies

09 51 00 - Acoustical Ceilings

09 65 00 - Resilient Flooring

09 90 00 - Painting and Coating

**DIVISION 10 -- SPECIALTIES**

10 44 00 - Fire Protection Specialties

**DIVISION 11 -- EQUIPMENT**

11 80 00 - Other Equipment

**DIVISIONS 12 - 21 -- (NOT USED)**

**DIVISION 22 -- PLUMBING**

21 05 10 - Basic Plumbing Requirements

22 05 53 - Identification for Plumbing Piping and Equipment

22 07 19 - Plumbing Piping Insulation

22 10 05 - Plumbing Piping

22 10 06 - Plumbing Piping Specialties

22 40 00 - Plumbing Fixtures

**DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)**

23 05 10 - Basic HVAC Requirements

23 23 00 - Refrigerant Piping

23 31 00 - HVAC Ducts and Casings

23 34 23 - HVAC Power Ventilators

23 81 29 - Variable Refrigerant Volume (VRV) HVAC System

**DIVISIONS 24 - 25 -- (NOT USED)**

**DIVISION 26 -- ELECTRICAL**

- 26 00 10 - Electrical General Provisions
- 26 05 01 - Minor Electrical Demolition
- 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 34 - Conduit
- 26 05 35 - Surface Raceways
- 26 05 37 - Boxes
- 26 05 53 - Identification for Electrical Systems
- 26 09 23 - Lighting Control Devices
- 26 24 16 - Panelboards
- 26 27 17 - Equipment Wiring
- 26 27 26 - Wiring Devices
- 26 51 00 - Interior Lighting

**DIVISION 27 -- COMMUNICATIONS (NOT USED)**

**DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY**

- 28 31 00 - Fire Detection and Alarm

**DIVISIONS 29 - 30 -- (NOT USED)**

**DIVISION 31 -- EARTHWORK**

- 31 10 00 - Site Clearing
- 31 22 00 - Grading
- 31 23 16 - Excavation
- 31 23 23 - Fill
- 31 31 16 - Termite Control

**DIVISION 32 -- EXTERIOR IMPROVEMENTS**

- 32 11 23 - Aggregate Base Courses
- 32 13 13 - Concrete Paving
- 32 31 13 - Chain Link Fences
- 32 92 23 - Sodding

**DIVISIONS 33 - 49 -- (NOT USED)**

**END OF TABLE OF CONTENTS**

**This page was intentionally left blank for duplex printing.**



**SECTION 00 11 00**  
**NOTICE TO BIDDERS**

**RE: ANIMAL VILLAGE QUARANTINE PENS FOR CITY OF LITTLE ROCK**

**FROM:**

The City of Little Rock, Arkansas (hereinafter referred to as Owner).

And the Design Firm of Cromwell Architects Engineers, 101 South Spring Street; Little Rock, Arkansas 72201; telephone: 501-372-2900 (hereinafter referred to as Architect Engineer).

1. Contact: Mr. Mark Littrell, AIA, <mlittrell@cromwell.com>.

**TO: INTERESTED BIDDERS**

- A. Time and Place: Sealed bids for the designated Work will be received by until 3:00 PM official local time at the place receiving bids, on April 21, 2015 and publicly opened at the offices of City of Little Rock Purchasing, 500 W Markham St, Suite 301, Little Rock, AR 72201 Attention: Abdoul Kabaou.
- B. Description: A Single Lump Sum Proposal is requested on a Contract for the Construction of Animal Village Quarantine Pens for the City of Little Rock in accordance with the Drawings and Specifications.
- C. Examination and Procurement Of Documents: Bidding and Contract Documents may be examined and/or obtained at the office of Cromwell Architects Engineers, 101 S. Spring, Little Rock, Arkansas 72201-2490, Telephone (501) 400-1006, Printshop@cromwell.com.
- D. Bid Security: A 5% Bid Security is required with Bid.
- E. Bid Requirements: The Owner reserves the right to reject bids and waive formalities. Bidder must have a current general or specialty license from the Arkansas Contractor's Licensing Board. The bid proposal and work of the proposed contract shall be in accordance with all applicable federal, state, county, and local laws, ordinances, and regulations.
- F. Mandatory Pre-Bid Conference:
  - 1. Time and Date: April 7, 2015 at 9:00 AM.
  - 2. Location: Animal Village located at 4500 Kramer Street, Little Rock, Arkansas.
- G. The City of Little Rock encourages participation of small, minority, and woman own business enterprises in the procurement of goods, services, professional services, and construction, either as a general contractor or sub-contractor. It is further requested that whenever possible, majority contractors who require sub-contractors, seek qualified small, minority, and woman businesses to partner with them.
- H. Refer to other bidding requirements described in Section 00 20 00 - Instructions to Bidders.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 00 21 13**

**INSTRUCTIONS TO BIDDERS**

**FORM OF INSTRUCTIONS TO BIDDERS**

**1.01 SEE AIA DOCUMENT A701 - INSTRUCTIONS TO BIDDERS FOLLOWING THIS DOCUMENT.**

**1.02 MODIFICATIONS TO AIA A701**

- A. Refer to AIA Document A701, Instructions to Bidders, as amended, for the original text of the published standard instructions to bidders with Project specific changes indicated as modified text inline with the original text. References to Instructions to Bidders shall be as referring to the standard text as modified.

**1.03 REQUEST FOR INFORMATION**

- A. Use AIA Document G716-2004 Request for Information. A copy follows after the end of Section 01 30 00 - Administrative Requirements

**END OF INSTRUCTIONS TO BIDDERS**

**This page was intentionally left blank for duplex printing.**

# Instructions to Bidders

## AIA Document A701 - 1997 1997 Edition -Electronic Format

---

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification. AUTHENTICATION OF THIS ELECTRONICALLY DRAFTED AIA DOCUMENT MAY BE MADE BY USING AIA DOCUMENT D401.

Copyright 1970, 1974, 1978, 1987, © 1997 by The American Institute of Architects. Reproduction of the material herein or substantial quotation of its provisions without written permission of the AIA violates the copyright laws of the United States and will subject the violator to legal prosecution.

---

### TABLE OF ARTICLES

1. DEFINITIONS
2. BIDDER'S REPRESENTATIONS
3. BIDDING DOCUMENTS
4. BIDDING PROCEDURES
5. CONSIDERATION OF BIDS
6. POST-BID INFORMATION
7. PERFORMANCE BOND AND PAYMENT BOND
8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

---

AIA DOCUMENT A701 - INSTRUCTION TO BIDDERS - AIA - COPYRIGHT 1997 - THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVENUE N.W., WASHINGTON D.C. 20006-5292. WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced without violation until the date of expiration as noted below.

Electronic Format A701-1997

User Document: A701-1997.DOC -- 1/11/2000. AIA License Number 100534, which expires on 2/7/2016 -- Page #1

## ARTICLE 1 DEFINITIONS

- 1.1** Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.
- 1.2** Definitions set forth in the General Conditions of the Contract for Construction, ~~AIA Document A201~~, or in other Contract Documents are applicable to the Bidding Documents. The term "Owner" shall be as referring to the "City of Little Rock."
- 1.3** Addenda are written or graphic instruments issued by the Architect Engineer prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.
- 1.4** A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.
- 1.5** The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.
- 1.6** An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.
- 1.7** A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.
- 1.8** A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.
- 1.9** A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

## ARTICLE 2 BIDDER'S REPRESENTATIONS

- 2.1** The Bidder by making a Bid represents that:
- 2.1.1** The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.
- 2.1.2** The Bid is made in compliance with the Bidding Documents.
- 2.1.3** The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.
- 2.1.4** The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

## ARTICLE 3 BIDDING DOCUMENTS

### 3.1 COPIES

- 3.1.1** Bidders may review and/or obtain complete sets of the Bidding Documents from the issuing office as designated in the Advertisement or Invitation to Bid, ~~in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.~~

~~3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders. Bidders may access complete electronic documents through the Cromwell Newforma Info Exchange web site. Valid email address required for accessing the Info Exchange web site; contact printshop@cromwell.com. Info Exchange will send email with instructions and links to the Info Exchange web site instead of attachments.~~

.1 Hard copies of the Project Manual and Drawings may also be purchased for a non-refundable fee at the office of Cromwell Architects Engineers, printshop@cromwell.com and as indicated in the Invitation To Bid.

.2 Bidders, Subcontractors, suppliers, and others who obtain plans directly from any other source are fully responsible for obtaining all necessary documents for a complete bid. This includes the verification and incorporation of addenda or revision bulletins, prior to bidding the project.

**3.1.3** Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect Engineer assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

**3.1.4** The Owner and Architect Engineer may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

### **3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS**

**3.2.1** The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect Engineer errors, inconsistencies or ambiguities discovered.

**3.2.2** Requests from Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect Engineer at least seven days prior to the date for receipt of Bids. Requests shall be made through a prime Bidder.

**3.2.3** Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

### **3.3 SUBSTITUTIONS**

**3.3.1** The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

**3.3.2** No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect Engineer at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect Engineer's decision of approval or disapproval of a proposed substitution shall be final.

**3.3.3** If the Architect Engineer approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

~~3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.~~  
Substitutions will be considered after the contract has been executed and in accordance with the General Conditions of the Contract and Division 01 requirements.

### **3.4 ADDENDA**

**3.4.1** Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

**3.4.2** Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

~~3.4.3 Deleted Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.~~

3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

## ARTICLE 4 BIDDING PROCEDURES

### 4.1 PREPARATION OF BIDS

4.1.1 Bids shall be submitted on the forms included with the Bidding Documents. Copies of the forms included with the Bidding Documents may be submitted. Submit one copy of the Bid Proposal.

4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

4.1.3 ~~Sums~~ Where so indicated by the makeup of the bid form, sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

### 4.2 BID SECURITY

4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required ~~if so stipulated in the Instructions to Bidders~~. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, ~~if required~~, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Paragraph 6.2.

.1 Pursuant to Act 1015 of 2013 which becomes effective on August 16, 2013, all bonds submitted to CoLR (bid bonds and Performance/Payment Bonds) must be issued by surety companies that are listed on current United State Department of Treasury's Listing of Approved Sureties. On and after this date, any bid bonds submitted by a bidder that are not issued by a surety company qualified and authorized to do business within Arkansas and listed as an approved surety on the US Department of Treasury list will be rejected.

.2 Any performance and payment bonds provided by the Contractor that are not issued by a surety company qualified and authorized to do business within Arkansas and listed as an approved surety on the US Department of Treasury list shall be considered as a contractor's default in failing to execute and deliver the contract and bonds. The contractor is liable to the project owner in the amount of the 5% bid surety. To verify current list of surety companies, please go to: [http://www.publicdebt.treas.gov/fsreports/ref/suretyBnd/c570\\_a-z.htm](http://www.publicdebt.treas.gov/fsreports/ref/suretyBnd/c570_a-z.htm) and search surety company name in the A to Z database listing.

4.2.2 ~~If a surety bond is required, it~~ Bid security, which includes enclosing a cashiers check payable to the order of the City of Little Rock drawn upon a bank or trust company doing business in Arkansas or by a corporate bid bond, shall be in the amount of 5% of the Base Bid. shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding



~~Documents, and the~~ The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

**4.2.3** The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

### **4.3 SUBMISSION OF BIDS**

**4.3.1** All copies of the Bid, the bid security, ~~if any~~, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, CoLR Bid #, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. ~~If it is not, the sealed envelope will have to be opened to identify.~~ If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

**4.3.2** Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

**4.3.3** The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

**4.3.4** Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

### **4.4 MODIFICATION OR WITHDRAWAL OF BID**

**4.4.1** A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

**4.4.2** Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

**4.4.3** Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

**4.4.4** Bid security, ~~if required~~, shall be in an amount sufficient for the Bid as resubmitted.

**4.4.5** Bidders may submit written modification (if any) on Bidder's letterhead stationery and at any time prior to the bid opening date and time. Written changes on bid envelope will not be accepted.

## **ARTICLE 5 CONSIDERATION OF BIDS**

### **5.1 OPENING OF BIDS**

At the discretion of the Owner, ~~if stipulated in the Advertisement or Invitation to Bid~~, the properly identified Bids received on time will be publicly-opened and will be read aloud. Bids will be taken under advisement. An abstract of the Bids may be made available to Bidders.

### **5.2 REJECTION OF BIDS**

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

### **5.3 ACCEPTANCE OF BID (AWARD)**

**5.3.1** It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests. Quality, time and probability of performance may be factors in making an award. In the event of two or more identical low bids, the contract may be awarded arbitrarily or for any reason to any of such bidders or split in any proportion between them at the discretion of the CoLR Purchasing Division.

**5.3.2** The Owner shall have the right to accept Alternates (if any) in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

## ARTICLE 6 POST-BID INFORMATION

### 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

~~Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, Low bidder shall submit upon request a properly executed AIA Document A305, Contractor's Qualification Statement for consideration and as a prerequisite to the award of the contract, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents, submitted for review to the Architect Engineer's office within the past six months.~~

### 6.2 OWNER'S FINANCIAL CAPABILITY ~~Omitted~~

~~The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.~~

### 6.3 SUBMITTALS

**6.3.1** The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect Engineer in writing:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

**6.3.2** The Bidder will be required to establish to the satisfaction of the Architect Engineer and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

**6.3.3** Prior to the execution of the Contract, the Architect Engineer or Owner will notify the Bidder in writing if either the Owner or Architect Engineer, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect Engineer has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

**6.3.4** Persons and entities proposed by the Bidder and to whom the Owner and Architect Engineer have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect Engineer.

## ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

### 7.1 BOND REQUIREMENTS

~~7.1.1 If stipulated in the Bidding Documents, The Bidder shall furnish bonds if amount of any bid exceeding \$20,000 covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.~~

- .1 Pursuant to Act 1015 of 2013 which becomes effective on August 16, 2013, all bonds submitted to CoLR (bid bonds and Performance/Payment Bonds) must be issued by surety companies that are listed on current United State Department of Treasury's Listing of Approved Sureties. On and after this date, any bid bonds submitted by a bidder that are not issued by a surety company qualified and authorized to do business within Arkansas and listed as an approved surety on the US Department of Treasury list will be rejected.

.2 Any performance and payment bonds provided by the Contractor that are not issued by a surety company qualified and authorized to do business within Arkansas and listed as an approved surety on the US Department of Treasury list shall be considered as a contractor's default in failing to execute and deliver the contract and bonds. The contractor is liable to the project owner in the amount of the 5% bid surety. To verify current list of surety companies, please go to: [http://www.publicdebt.treas.gov/fsreports/ref/suretyBnd/c570\\_a-z.htm](http://www.publicdebt.treas.gov/fsreports/ref/suretyBnd/c570_a-z.htm) and search surety company name in the A to Z database listing.

~~7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the The cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.~~

7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

## **7.2 TIME OF DELIVERY AND FORM OF BONDS**

7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Subparagraph 7.2.1.

~~7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum. Extent of the Performance Bond and the Labor and Material Payment Bond shall each be written in the amount equal to 100 percent of the Contract Sum. (Arkansas Code §§ 19-4-1405 et seq., §§ 22-9-401 et seq., §§ 18-44-501 et seq.)~~

7.2.3 The bonds shall be dated on or after the date of the Contract.

7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

## **ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR**

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

## **ARTICLE 9 ADDITIONAL REQUIREMENTS**

### **9.1 RETAINAGE**

A retainage will be withheld from Progress Payments as specified in the General Conditions.

### **9.2 TIME OF COMPLETION**

The Work required by the Contract Documents shall be Substantially Complete as indicated in the Bid Proposal.

### **9.3 MANDATORY PRE-BID CONFERENCES**

There will be a mandatory pre-bid conference if stipulated in the Advertisement or Invitation To Bid.

### **9.4 NON-COLLUSIVE AFFIDAVIT**

By submitting a bid, the Bidder represents and warrants that such bid is genuine and is neither collusive or made in the interest of any person not named, and that he has neither induced nor solicited any other company to place a sham bid nor directly or indirectly caused another company to refrain from or be unable to present a bid.

### **9.5 PENALTY FOR COLLUSION**

If at any time it shall be found that the person, firm or corporation to whom a contract has been awarded has, in presenting any bid, colluded with any other party or parties, then the contract so awarded shall be null and void and the contractor shall be liable to the Owner for any and all loss and damage of whatever nature, which the Owner may suffer and the Owner shall seek a new contractor.

## **9.6 CONFLICT OF INTEREST/DISCLOSURE STATEMENT**

The City of Little Rock selects its board and commission members through a process that utilizes an executive session. Under Arkansas law, this fact deems a volunteer an employee for a limited purpose. The City cannot contract with an employee, and cannot contract with a corporation with an employee in an executive or managerial position who also serves as a volunteer on a City board or commission unless it first passes an ordinance to approve the contract. Is any person involved with this Bid an employee of the City, or a volunteer board or commission member who also holds an executive or managerial position with the Bidder? If the answer is "yes," please identify the person(s) and the nature of the relationship. THIS DOES NOT MEAN that the Bidder is disqualified; but, the apparent successful Bidder will not be selected if the Board of Directors fails to pass an ordinance to authorize the contract, regardless of the amount.

By submitting a bid, the company represents and warrants that no director or employee of the Owner, except as identified in Bidder's Disclosure Statement submitted with the bid, is in any manner interested directly or indirectly in the bid or contract which may result from it or in any of the expected profits which might arise therefrom; and, that no attempt has been made to influence or gain favorable advantage by communicating directly or indirectly with any official of the Owner. It is understood, that any action taken which might tend to degrade the integrity of the competitive bidding process will be considered as grounds for disqualification.

## **9.7 INDEMNIFICATION**

Contractor agrees to save and hold harmless and to indemnify the Owner against any and all liability, losses, claims or costs of whatever kind of nature for any occurrence or accident in connection with or in the performance of any work/services pursuant to the award whether to property or persons.

## **9.8 RESERVATIONS**

Soliciting bids does not commit the Owner to award a contract, to pay any costs incurred in the preparation of a bid in response to this bid, or to procure or contract for services or supplies. The Owner reserves the right to accept, or reject, in part or its entirety, any bid received as a result of this solicitation, if it is in the best interest of the Owner to do so.

## **9.9 ASSIGNMENTS**

Neither this contract nor any interest therein nor claim thereunder shall be assigned or transferred by the Contractor except as expressly authorized in writing by the Owner and no contract shall be made by the Contractor with any other party for furnishing any of the work or services herein contracted for without the written approval of the Owner.

## **9.10 DISCRIMINATION**

In the event a contract is entered into pursuant to this solicitation, the bidder shall not discriminate against any qualified employee or qualified applicant for employment because of race, sex, color, creed, national origin, ancestry, or disability. The contractor must include in any and all subcontracts a provision similar to the preceding.

## **9.11 SMALL, MINORITY, AND WOMEN BUSINESS ENTERPRISES**

All small, minority, and women business enterprises are encouraged to submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.

## **9.12 ILLEGAL IMMIGRANTS**

The lowest responsible bidder shall certify prior to executing the contract that they do not employ or contract with any illegal immigrants.

## **9.13 RELATED WEB LINKS**

For Bidder's information and convenience following are related website resources:

State of Arkansas; [www.state.ar.us](http://www.state.ar.us) or [www.accessarkansas.org](http://www.accessarkansas.org)

Arkansas Code On-line; <http://www.lexisnexis.com/hottopics/arcodes/Default.asp>

Arkansas Legislature; [www.arkleg.state.ar.us](http://www.arkleg.state.ar.us)

Arkansas Contractor's Licensing Board; [www.state.ar.us/clb](http://www.state.ar.us/clb) & <http://www.contractors-license.org/ar/ar.htm>

Arkansas Department of Health; [www.healthylarkansas.com/rules\\_regs/rules\\_regs.htm](http://www.healthylarkansas.com/rules_regs/rules_regs.htm) & [www.healthylarkansas.com/phc/](http://www.healthylarkansas.com/phc/)

U.S. Department of Treasury's Listing of approved sureties; [http://www.publicdebt.treas.gov/fsreports/ref/suretyBnd/c570\\_az.htm](http://www.publicdebt.treas.gov/fsreports/ref/suretyBnd/c570_az.htm)

U.S. Occupational Safety and Health Agency; <http://www.osha.gov>

CREMATORIUM ADDITION  
For Animal Village, City of Little Rock, Arkansas

CoLR Bid# 15128  
(AE#2014-205-10)

**SECTION 00 41 00**  
**BID PROPOSAL FORM**

<<INSERT: 00 41 00 - BID PROPOSAL FORM PDF >>

**This page was intentionally left blank for duplex printing.**

**SECTION 00 52 00**  
**AGREEMENT FORM**

**PART 1 GENERAL**

**1.01 FORM OF AGREEMENT**

**1.02 THE AGREEMENT TO BE EXECUTED IS ATTACHED FOLLOWING THIS PAGE.**

**1.03 RELATED REQUIREMENTS**

A. Section 00 72 00 - General Conditions.

**1.04 MODIFICATIONS TO THE AGREEMENT FORM**

A. Article 3 - Contract Time

1. Section 3.1: Time of Completion: Within [ ] calendar days.
2. Section 3.2: Liquidated Damages: [\$ ] per day.

B. Article 8 - Miscellaneous

1. Section 8.7: As determined by Resolution of the City of Little Rock Board of Directors.

C. Article 9 - Insurance and Bonding.

1. Section 9.2: Not less than \$[ ] for personal injury. Not less than \$[ ] for property damage and other liabilities.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF AGREEMENT**

**This page was intentionally left blank for duplex printing.**



# AGREEMENT

---

Agreement between Owner and Contractor  
on the Basis of Stipulated Price

---

(Based on EJCDC 1910-8-A-1, 1990 edition)

THIS AGREEMENT is dated as of the \_\_\_\_ day of \_\_\_\_\_ in the year 20\_\_\_\_  
by and between the City of Little Rock (hereinafter called "Owner") and  
\_\_\_\_\_ (hereinafter called "Contractor").

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

## Article 1. WORK

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

[Description of Work]

## Article 2. ARCHITECT

The Project has been designed by:

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

## Article 3. CONTRACT TIME

**3.1** The Work included in this contract shall be completed within \_\_\_\_\_ calendar days of the date specified on the Notice to Proceed.

**3.2** Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 of this Agreement, plus any extensions thereof allowed in accordance with Article 15 of the General Conditions. The Owner and Contractor also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay, but not as penalty, Contractor shall pay Owner \_\_\_\_\_ Dollars (\$\_\_\_\_\_) per day

for each day that expires after the time specified in paragraph 3.1 of this Agreement for completion of Work until the Work is complete and ready for final payment. There shall be no exemptions because of weather conditions if the Owner certifies that work within the structure could have proceeded despite the weather. **The Owner has the right to withhold any such sums as liquidated damages from the final payment to the Contractor.**

#### Article 4. CONTRACT PRICE

4.1 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents in current funds as follows:

A lump sum Contract Price of \$ \_\_\_\_\_ dollars.  
(written amount)

#### Article 5. PAYMENT PROCEDURES

Contractor shall submit Applications For Payment in accordance with Article 19 of the General Conditions. Applications for Payment will be processed as provided in the General Conditions.

5.1 Progress Payments: Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 20th day of each month during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the schedule of values established in Article 3 of the General Conditions, and in the case of Unit Price Work based on the number of units completed, or, in the event there is no schedule of values, as provided in the General Conditions.

5.1.1 The Owner shall retain five percent (5%) of the amount of each progress payment to assure faithful performance of the contract. Progress payments will be made in accordance with Article 19 of the General Conditions and, in each case, less the aggregate of payments previously made and less such amounts the Owner may withhold in accordance with Section 3.2 and Article 19 of the General Conditions.

5.1.2 ~~In accordance with Ark. Code Ann. § 22-9-604, Upon certification by the Architect that the Work under this contract has been fifty percent (50%) completed, there will be no additional retainage on account of Work completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to one hundred percent (100%) of the Work completed, less such amounts the Owner may withhold in accordance with Section 3.2 and Article 19 of the General Conditions.~~ If the Contract Document allow for phased work in which completion may occur on a partial occupancy, any retention proceeds withheld and retained under the Contract Documents shall be partially released within thirty (30) days under the same conditions under the Contract Documents in direct proportion to the value of the part of the capital improvement completed. All sums withheld by the Owner

shall be paid to the Contractor within thirty (30) days after the construction contract has been completed.

**5.1.3** In accordance with Ark. Code Ann. § 22-9-604, if the Contractor is required by the Contract Documents to purchase and furnish materials or equipment that will be stored on the job site or in a bonded warehouse and used in the Work, no retainage will be withheld on that amount of the submitted progress payment pertaining to the cost of these stored materials or equipment.

**5.2** Final Payment. Upon final completion and acceptance of the Work in accordance with Article 19 of the General Conditions, and after the Owner receives ALL lien waivers and ALL other proper documentation from the Contractor, Owner shall pay the remainder of the Contract Price as provided in said Article 19.

## **Article 6. CONTRACTOR'S REPRESENTATIONS**

In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

**6.1** Contractor has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the Work. Contractor covenants and agrees to comply with all applicable laws, statutes, regulations, ordinances and permits relating to the performance of this contract.

**6.2** Contractor has studied carefully all reports of explorations and tests of subsurface conditions and drawings of physical conditions, and accepts the determination of the extent of the technical data contained in such reports and drawings upon which Contractor is entitled to rely.

**6.3** Contractor has obtained and carefully studied, or assumes responsibility for obtaining and carefully studying, all such examinations, investigations, explorations, tests, reports and studies, in addition to or to supplement those referred to in paragraph 6.2 above, which pertain to the subsurface or physical conditions at or contiguous to the site or otherwise that may affect the cost, progress, performance or furnishing of the Work as Contractor considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Documents. No additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by Contractor for such purposes.

**6.4** Contractor has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports, studies or similar information or data with respect to said Underground Facilities are or will be required by

Contractor in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents.

- 6.5 Contractor has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- 6.6 Contractor has given Owner written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by Owner is acceptable to Contractor.
- 6.7 **Not less than the prevailing hourly rate of wages, as determined by the Arkansas Department of Labor, shall be paid to all workers performing Work under the Contract Documents.**

#### **Article 7. CONTRACT DOCUMENTS**

The Contract Documents which comprise the entire agreement between Owner and Contractor concerning the Work consist of the following:

- 7.1 This Agreement.
- 7.2 The bound Project Manual dated \_\_\_\_\_, \_\_\_\_\_.
- 7.3 Release of Liability and Hold Harmless Agreement dated \_\_\_\_\_, \_\_\_\_\_.
- 7.4 Performance and Payment Bonds.
- 7.5 Notice of Award.
- 7.6 Notice to Proceed.
- 7.7 General Conditions.
- 7.8 Supplementary Conditions, if any.
- 7.9 Specifications.
- 7.10 Drawings.
- 7.11 Addenda numbers \_\_\_ to \_\_\_, inclusive.
- 7.12 Invitation to Bid, Instructions to Bidders, Bid Form, and Contractor's Bid.
- 7.13 The following which may be delivered or issued after the Effective Date of the Agreement

and are not attached hereto: All written amendments and other documents amending, modifying or supplementing the Contract Documents pursuant to the provisions of this Agreement and the General Conditions, including any written Change Orders and written Field Orders.

There are no Contract Documents other than those listed above in this Article 7. The Contract Documents may only be amended, modified or supplemented as provided in Subsections 13.1 and 13.2 of the General Conditions and the provisions of this Agreement.

## **Article 8. MISCELLANEOUS**

- 8.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 8.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation moneys that may become due and moneys that are due may not be assigned without such consent, except to the extent that the effect of this restriction may be limited by law. Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 8.3 Owner and Contractor each binds themselves, their partners, successors and legal representatives to the other party hereto, their partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.
- 8.4 Nondiscrimination: Contractor agrees to comply with all applicable federal and state laws and regulations regarding nondiscrimination, and specifically agrees not to discriminate against any individual because of race, religion, sex, national origin or disability, and to require such compliance in contractual agreements with subcontractors and sub-subcontractors.
- 8.5 Contractor agrees to comply with the Americans with Disabilities Act and the Equal Employment Opportunity Act, as well as regulations promulgated pursuant thereto, and to require such compliance in contractual agreements with subcontractors and sub-subcontractors.
- 8.6 Modification: Any modification to this contract shall be in writing, signed by all parties to the contract.
- 8.7 The Contract Price shall not be increased above \$\_\_\_\_\_, the amount authorized by Resolution No. \_\_\_\_\_ adopted by the Owner's Board of Directors on \_\_\_\_\_. Any such increase in the Contract Price shall receive prior written approval by the Owner's City Manager and prior approval by the Owner's Board of

Directors, if required or necessary.

- 8.8 All Change Orders and Field Orders shall be executed by the Owner. Individuals authorized to execute such Change Orders and Field Orders are the Owner's Project Coordinator, City Manager, or their appointee.
- 8.9 This contract is governed by the laws of the State of Arkansas.
- 8.10 Nothing contained in the Contract Documents shall create a contractual relationship with, or cause of action in favor of, a third party against the Owner or Contractor.
- 8.11 Independent Contractor: It is expressly agreed that Contractor is acting as an independent contractor in performing the services specified herein. The Owner shall carry no workers' compensation insurance, health or accident insurance to cover the Contractor or Contractor's employees for any type of loss which might result to the Contractor or the Contractor's employees in connection with the performance of the Work set forth in this Agreement. The Owner shall not pay any contribution to Social Security, unemployment insurance, federal or state withholding taxes, nor provide any other contributions or benefits which might otherwise be expected in an employer-employee relationship, it being specifically agreed that the Contractor is not acting herein as an employee of Owner, but shall, at all times, and in all respects, have the rights and liabilities of an independent contractor.
- 8.12 Severability: In the event any section, subsection, subdivision, paragraph, subparagraph, item, sentence, clause, phrase, or word of the Contract Documents is declared or adjudged to be invalid or unconstitutional, such declaration or adjudication shall not affect the remaining provisions of the Contract Documents, as if such invalid or unconstitutional provision was not originally a part of the Contract Documents.
- 8.13 The statute of limitation period shall be tolled for any fraudulent act committed by the Contractor that the Owner cannot discover upon due diligence.
- 8.14 The officials who have executed this contract hereby represent and warrant that they have full and complete authority to act on behalf of the Owner and Contractor, respectively, and that their signatures below, the terms and provisions hereof, constitute valid and enforceable obligations of each.
- 8.15 This Agreement shall be executed in the original, and any number of copies. Any copy of this Agreement so executed shall be deemed an original, and shall be deemed authentic for any other use.
- 8.16 Nothing stated within the Contract Documents shall be construed as limiting the Owner's immunity from liability in tort.
- 8.17 The Owner does not agree with or consent to arbitration or mediation of disputes relating to

this Agreement or Project.

- 8.18 The Contractor agrees that it shall indemnify and save harmless the Owner, its officers, agents, and employees from any claims or losses for services rendered by any subcontractor, person or firm performing or supplying services, materials or supplies in connection with the performance of this Agreement.
- 8.19 The Contractor shall ensure that the Owner receives lien waivers from all subcontractors and sub-subcontractors before Work begins on the Project. The Contractor shall give Written Notice to the subcontractors and sub-subcontractors providing Work on the Project that states the following: “*According to Arkansas law, it is understood that no liens can be filed against public property if a valid and enforceable payment and performance bond is in place. Regarding this Project and Agreement, the valid and enforceable bonds are with (name of surety).*” The Contractor shall have each subcontractor and sub-subcontractor execute a written receipt evidencing acknowledgment of this statement.
- 8.20 The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, disability or national origin. The Contractor will take appropriate action to insure that applicants are employed, and that employees are treated during employment without regard to their race, creed, color or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and agrees to post in conspicuous places, available to employees, such notices as may be provided by the Owner setting forth the provisions of this non-discrimination clause. Contractor agrees to comply with the Americans with Disabilities Act, and regulations promulgated pursuant thereto, as relates to the performance of this contract.
- 8.21 No Waiver of Enforcement of Contract Provisions: Failure of the Owner to enforce at any time any of the provisions of this Agreement, or to require at any time performance by the Contractor of any of the provisions hereof, shall in no way be construed to be a waiver of such provisions, nor in any way to affect the validity of this Agreement, or any part thereof, or the right of the Owner to thereafter enforce each and every such provision.
- 8.22 Entire Agreement: The Contract Documents contain the complete and entire agreement of the parties respecting the transactions contemplated herein, and supersede all prior negotiations, agreements, representations, and understandings, if any, among the parties regarding such matters. All prior or contemporaneous agreements, understandings, and statements, oral or written, are merged into the Contract Documents.
- 8.23 Captions: All captions contained in the Contract Documents are inserted only as a matter of convenience and in no way define, limit or extend the scope or intent of the Contract Documents.

**ARTICLE 9. INSURANCE AND BONDING**

- 9.1 The Contractor shall provide a Performance Bond, according to Arkansas law, insuring the Owner of the performance of all of the terms, provisions and stipulations of this Agreement. The Contractor shall also provide a Payment Bond, according to Arkansas law. Said Bonds shall be issued by a company duly authorized to transact such business within the State of Arkansas. Said Performance and Payment Bonds shall be acquired and delivered to the Owner prior to the issuance of the Notice to Proceed. If required by the Contractor, each listed subcontractor must provide the Contractor with a payment and performance bond made by a surety company, or a cash bond in a sum equal to the full amount of the subcontractor's bid on a portion of a public works contract when: (A) The subcontractor is the low responsible bidder for that portion of the contract; (B) The Contractor is required to list the subcontractor in the Contractor's bid; and (C) The work value of the subcontractor's bid is in excess of fifty thousand dollars (\$ 50,000).
- 9.2 The Contractor shall furnish the Owner with a certificate of insurance naming the City as an insured on a policy of insurance indemnifying and insuring the City in amounts not less than \$ \_\_\_\_\_ for personal injury and \$ \_\_\_\_\_ for property damage and other liabilities. Such insurance shall be acquired and the certificate delivered to the Owner prior to the issuance of the Notice to Proceed. **The Contractor shall give the Owner thirty (30) calendar days advance written notice of any cancellation, reduction, or modification of such insurance.**

**IN WITNESS WHEREOF**, Owner and Contractor have signed this Agreement in duplicate. One counterpart each has been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or identified by Owner and Contractor.

This Agreement will be effective on \_\_\_\_\_.

[Signatures on Next Page]



**OWNER:**

CITY OF LITTLE ROCK

By: \_\_\_\_\_  
Bruce Moore, City Manager

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

**ATTEST:**

\_\_\_\_\_  
Nancy Wood, City Clerk

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

**APPROVED AS TO LEGAL FORM:**

Thomas M. Carpenter, City Attorney

By: \_\_\_\_\_

Deputy City Attorney

**Address for giving notices:**

City of Little Rock  
500 West Markham, Rm. \_\_\_\_\_  
Little Rock, AR 72201

**CONTRACTOR:**

\_\_\_\_\_

By: \_\_\_\_\_

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

**Address for giving notices:**  
(Contractor's Address)

**Employer Identification Number:**

[End of Section]

**This page was intentionally left blank for duplex printing.**

**SECTION 00 72 00**  
**GENERAL CONDITIONS**

**PART 1 - GENERAL**

**1.01 FORM OF GENERAL CONDITIONS**

A. The General Conditions applicable to this contract is attached following this page.

**1.02 SUPPLEMENTARY CONDITIONS**

A. Refer to Document 00 73 00 for amendments to these General Conditions.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF DOCUMENT**

**This page was intentionally left blank for duplex printing.**

## GENERAL CONDITIONS

1. Definitions
2. Additional Instruction & Detail Drawings
3. Schedules, Reports & Records
4. Drawings and Specification
5. Shop Drawings
6. Materials, Services & Facilities
7. Inspection & Testing
8. Substitutions
9. Patents
10. Surveys, Permits & Regulations
11. Protection of Work, Property & Persons
12. Supervision by Contractor
13. Changes in the Work
14. Changes in Contract Price
15. Time for Completion & Liquidated Damages
16. Correction of Work
17. Subsurface Conditions
18. Suspension of Work, Termination & Delay
19. Payments to Contractor
20. Acceptance of Final Payment as Release
21. Insurance
22. Contract Security
23. Assignments
24. Indemnification
25. Separate Contracts
26. Subcontracting
27. Land & Rights of Way
28. Guaranty
29. Taxes
30. Architect's Authority

### 1. DEFINITIONS

- 1.1 Wherever used in the CONTRACT DOCUMENTS, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:
- 1.2 AGREEMENT - Contract between the OWNER and CONTRACTOR regarding the PROJECT.

- 1.3** ADDENDA - Written or graphic instruments issued prior to the time of opening the bids which modify or interpret the CONTRACT DOCUMENTS, DRAWINGS and SPECIFICATIONS, by additions, deletions, clarification or corrections.
- 1.4** BID - The offer or proposal of the BIDDER submitted on the prescribed form setting forth the prices for the WORK to be performed.
- 1.5** BIDDER - Any person, firm or corporation submitting a BID for the WORK.
- 1.6** BONDS - Bid, Performance, and Payment Bonds, and other instruments of security, furnished by the CONTRACTOR and his surety in accordance with the CONTRACT DOCUMENTS.
- 1.7** CHANGE ORDER - A written order to the CONTRACTOR authorizing an addition, deletion or revision of the WORK within the general scope of the CONTRACT DOCUMENTS, or authorizing an adjustment in the CONTRACT PRICE or CONTRACT TIME.
- 1.8** CONTRACT DOCUMENTS - The contract, including BID, AGREEMENT, Payment Bond, Performance Bond, General Conditions, SUPPLEMENTARY CONDITIONS; NOTICE OF AWARD, NOTICE TO PROCEED, CHANGE and FIELD ORDERS, DRAWINGS, SPECIFICATIONS, and ADDENDA.
- 1.9** CONTRACT PRICE - The total monies payable to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.
- 1.10** CONTRACT TIME - the number of calendar days stated in the CONTRACT DOCUMENTS for the completion of the WORK.
- 1.11** CONTRACTOR - The person, firm or corporation with whom the OWNER has executed the Agreement.
- 1.12** DRAWINGS - The part of the CONTRACT DOCUMENTS which show the characteristics and scope of the WORK to be performed and which have been prepared or approved by the ARCHITECT.
- 1.13** ARCHITECT- The person, firm or corporation named as such in the CONTRACT DOCUMENTS.
- 1.14** FIELD ORDER - A written order effecting a change in the WORK not involving an adjustment in the CONTRACT PRICE, or an extension of the CONTRACT TIME, issued by the ARCHITECT and OWNER to the CONTRACTOR during construction.
- 1.15** NOTICE OF AWARD - The written notice of the acceptance of the BID from the OWNER to the successful BIDDER.

- 1.16** NOTICE TO PROCEED - Written communication issued by the OWNER to the CONTRACTOR authorizing him to proceed with the WORK and establishing the date of commencement of the WORK.
- 1.17** OWNER - A public or quasi-public body or authority, corporation, association, partnership, or individual for whom the WORK is to be performed.
- 1.18** PROJECT - The undertaking to be performed as provided in the CONTRACT DOCUMENTS.
- 1.19** PROJECT COORDINATOR or RESIDENT PROJECT REPRESENTATIVE - The authorized representative of the OWNER who is assigned to the PROJECT site, or any part thereof.
- 1.20** SHOP DRAWINGS - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the CONTRACTOR, a SUBCONTRACTOR, MANUFACTURER, SUPPLIER or distributor, which illustrate how specific portions of the WORK shall be fabricated or installed.
- 1.21** SPECIFICATIONS - A part of the CONTRACT DOCUMENTS consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards, and workmanship.
- 1.22** SUBCONTRACTOR - An individual, firm or corporation having a direct contract with the CONTRACTOR, or with any other SUBCONTRACTOR, for the performance of a part of the WORK at the site.
- 1.23** SUBSTANTIAL COMPLETION - That date, when the construction of the PROJECT, or a specified part thereof, is sufficiently completed in accordance with the CONTRACT DOCUMENTS, so that the PROJECT, or specified part, can be utilized for the purposes for which it is intended.
- 1.24** SUPPLEMENTARY CONDITIONS - Modifications to adapt the General Conditions to the specific requirements of the Project and that may be imposed by applicable federal, state, and local laws.
- 1.25** SUPPLIER - Any person or organization who supplies materials or equipment for the WORK, including that fabricated to a special design, but who does not perform labor at the site.
- 1.26** WORK - All labor necessary to produce the construction required by the CONTRACT DOCUMENTS, and all materials and equipment incorporated or to be incorporated in the PROJECT. Unless otherwise specified, all materials shall be new, and both workmanship

and materials shall be of a good quality. The CONTRACTOR shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

- 1.27** WRITTEN NOTICE - Any notice to any party of the Agreement relative to any part of this Agreement shall be in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party or his authorized representative.

## **2. ADDITIONAL INSTRUCTION AND DETAIL DRAWINGS**

- 2.1** The CONTRACTOR may be furnished additional instruction and detail drawings, by the ARCHITECT, as necessary to carry out the WORK required by the CONTRACT DOCUMENTS.
- 2.2** The additional drawings and instruction thus supplied will become a part of the CONTRACT DOCUMENTS. The CONTRACTOR shall carry out the WORK in accordance with the additional detail drawings and instructions.

## **3. SCHEDULES, REPORTS AND RECORDS**

- 3.1** The CONTRACTOR shall submit to the OWNER, upon request, such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, and other such records pertaining to the PROJECT.
- 3.2** Prior to the first partial payment estimate, the CONTRACTOR shall submit construction progress schedules showing the order in which he proposes to carry on the WORK, including dates at which he will start the various parts of the WORK, estimated date of completion of each part and, as applicable:
- 3.2.1** The dates at which special detail drawings will be required; and
- 3.2.2** Respective dates for submission of SHOP DRAWINGS, the beginning of manufacture, the testing and the installation of materials, supplies and equipment.

## **4. DRAWINGS AND SPECIFICATIONS**

- 4.1** The intent of the DRAWINGS and SPECIFICATIONS is that the CONTRACTOR shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the WORK in accordance with the CONTRACT DOCUMENTS, and all incidental work necessary to complete the PROJECT in an acceptable manner, ready for use, occupancy or operation by the OWNER.
- 4.2** It is understood and agreed that the CONTRACTOR has, by careful examination, satisfied himself as to the nature and location of the WORK, the conformation of the ground, the character of equipment and facilities needed preliminary to and during the execution of the WORK, the character, quality and quantity of the materials to be encountered, the general



and local conditions, and all other matters which can, in any way, affect the WORK under this CONTRACT.

- 4.3** In case of conflict between the DRAWINGS and SPECIFICATIONS, the SPECIFICATIONS shall govern. Figure dimensions on DRAWINGS shall govern over scale dimensions, and detailed DRAWINGS shall govern over general DRAWINGS.
- 4.4** Any discrepancies found between the DRAWINGS and SPECIFICATIONS and site conditions, or any inconsistencies or ambiguities in the DRAWINGS or SPECIFICATIONS, shall be immediately reported to the ARCHITECT, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. WORK done by the CONTRACTOR after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the CONTRACTOR'S risk.
- 4.5** CONTRACTOR acknowledges that, based upon the CONTRACTOR'S examination of the Drawings and Specifications which comprise a part of the Contract Documents, the CONTRACTOR has not observed anything in the Contract Documents indicating that same are incomplete or inconsistent or otherwise contain any error or omission that would cause the CONTRACTOR to be entitled to make any claim for increases in the CONTRACT PRICE or the CONTRACT TIME.
- 4.6** The intent of the CONTRACT DOCUMENTS is to include all items necessary for the proper execution and completion of the WORK by the CONTRACTOR. The CONTRACT DOCUMENTS are complimentary, and what is required by one shall be as binding as if required by all; performance by the CONTRACTOR shall be required to the extent inferable from the CONTRACT DOCUMENTS as being necessary to produce the intended results given the CONTRACTOR'S experience in general construction. The SPECIFICATIONS are written in the imperative and abbreviated form. The imperative language is directed to the CONTRACTOR, unless specifically noted otherwise. Any incomplete sentences shall be completed by inserting "shall," "the CONTRACTOR shall," "shall be," and similar mandatory phrases by inference in the same manner as they are applied to notes on the DRAWINGS. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, all indicated requirements shall be performed whether stated imperatively or otherwise. Further, whenever the term "WORK Includes" or "Section Includes" is used as an article or paragraph heading in a SPECIFICATIONS section, it is merely a listing of the significant items described within the section and is not intended to limit the scope of the section or to imply a trade responsibility.
- 4.7** Conflicts or discrepancies among the Contract Documents shall be resolved in the following order of priority:
1. The AGREEMENT;
  2. AMENDMENTS and revisions of later date take precedence over those of earlier date;
  3. SUPPLEMENTARY CONDITIONS;
  4. The GENERAL CONDITIONS;

5. The Project Manual;
6. DRAWINGS and SPECIFICATIONS: DRAWINGS GOVERN SPECIFICATIONS for quantity and location, and SPECIFICATIONS govern for quality and performance. In the event of an ambiguity in quantity or quality, the greater quantity and the better quality shall govern;
7. Figure dimensions govern scale dimensions and large scale DRAWINGS govern small scale DRAWINGS; and,
8. SUBMITTALS; if and only if OWNER concludes, in its sole discretion, that a conflict or discrepancy cannot be otherwise resolved.

## **5. SHOP DRAWINGS**

- 5.1 The CONTRACTOR shall provide SHOP DRAWINGS as may be necessary for the prompt prosecution of the WORK as required by the CONTRACT DOCUMENTS. The ARCHITECT shall promptly review all SHOP DRAWINGS.
- 5.2 When submitted for the ARCHITECT'S review, SHOP DRAWINGS shall bear the CONTRACTOR'S certification that he has reviewed, checked, and approved the SHOP DRAWINGS and that they are in conformance with the requirements of the CONTRACT DOCUMENTS.
- 5.3 Portions of the WORK requiring a SHOP DRAWING or sample submission shall not begin until the SHOP DRAWING or submission has been reviewed by the ARCHITECT. A copy of each processed SHOP DRAWING and each approved sample shall be kept in good order by the CONTRACTOR at the site and shall be available to the ARCHITECT AND OWNER.

## **6. MATERIALS, SERVICES AND FACILITIES**

- 6.1 It is understood that, except as otherwise specifically stated in the CONTRACT DOCUMENTS, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, sewer, light, utilities, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the WORK within the specified time.
- 6.2 Materials and equipment shall be so stored as to ensure the preservation of their quality and fitness for the WORK. Stored materials and equipment to be incorporated in the WORK shall be located so as to facilitate prompt inspection.
- 6.3 Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.
- 6.4 Materials, supplies and equipment shall be in accordance with samples submitted by the CONTRACTOR and approved by the ARCHITECT.

- 6.5** Materials, supplies or equipment to be incorporated into the WORK shall not be purchased by the CONTRACTOR or the SUBCONTRACTOR(S) subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

## **7. INSPECTION AND TESTING**

- 7.1** All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the CONTRACT DOCUMENTS.
- 7.2** The OWNER shall provide all inspection and testing services not required by the CONTRACT DOCUMENTS.
- 7.3** The CONTRACTOR shall provide, at the CONTRACTOR'S expense, the testing and inspection services required by the CONTRACT DOCUMENTS, unless otherwise noted.
- 7.4** If the CONTRACT DOCUMENTS, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction require any WORK to specifically be inspected, tested, or approved by someone other than the CONTRACTOR, the CONTRACTOR shall give the ARCHITECT AND OWNER timely notice of readiness. The CONTRACTOR will then furnish the ARCHITECT AND OWNER the required certificates of inspection, testing or approval.
- 7.5** Inspections, tests, or approvals by the ARCHITECT, OWNER or others shall not relieve the CONTRACTOR from his obligations to perform the WORK in accordance with the requirements of the CONTRACT DOCUMENTS.
- 7.6** The ARCHITECT, OWNER and their representatives will, at all times, have access to the WORK. In addition, authorized representatives and agents of any participating federal or state agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The CONTRACTOR shall provide proper facilities for such access and observation of the WORK and also for any inspection or testing thereof.
- 7.7** If any WORK is covered contrary to the written instructions of the ARCHITECT OR OWNER, it shall, if requested by the ARCHITECT OR OWNER, be uncovered for their observation and replaced by the CONTRACTOR at no increase in Contract Price.

## **8. SUBSTITUTIONS**

- 8.1** Whenever a material, article or piece of equipment is identified on the DRAWINGS or SPECIFICATIONS by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be

considered. The CONTRACTOR may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the CONTRACT DOCUMENTS by reference to brand name or catalogue number, and if, in the opinion of the OWNER, such material, article, or piece of equipment is of equal substance and function to that specified, the OWNER may approve its substitution and use by the CONTRACTOR. Any cost differential shall be deducted from the CONTRACT PRICE and the CONTRACT DOCUMENTS shall be appropriately modified by CHANGE ORDER. The CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute shall be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME.

## **9. PATENTS**

- 9.1** The CONTRACTOR shall pay all applicable royalties and license fees. The CONTRACTOR shall defend all law suits or claims for infringement of any patent rights and save the OWNER AND ARCHITECT harmless from loss on account thereof; however, if the CONTRACTOR has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the OWNER AND ARCHITECT.

## **10. SURVEYS, PERMITS, AND REGULATIONS**

- 10.1** The OWNER will furnish all boundary surveys and establish all base lines for locating the principal component parts of the WORK, together with a suitable number of bench marks adjacent to the WORK as shown in the CONTRACT DOCUMENTS. From the information provided by the OWNER, unless otherwise specified in the CONTRACT DOCUMENTS, the CONTRACTOR shall develop and make all detail surveys needed for construction such as slope sheets.
- 10.2** The CONTRACTOR shall carefully preserve bench marks, reference points and stakes and, in case of willful or careless destruction, the CONTRACTOR shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.
- 10.3** Permits and licenses of a temporary nature necessary for the prosecution of the WORK shall be secured and paid for by the CONTRACTOR unless otherwise stated in the SUPPLEMENTARY CONDITIONS. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the OWNER, unless otherwise specified. The CONTRACTOR shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the WORK as drawn and specified. If the CONTRACTOR observes that the CONTRACT DOCUMENTS are at variance therewith, he shall promptly notify the ARCHITECT AND OWNER, in writing, and any necessary changes shall be adjusted as provided in Section 13, CHANGES IN THE WORK.

## **11. PROTECTION OF WORK, PROPERTY AND PERSONS**

- 11.1** The CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the WORK and other persons who may be affected thereby, all the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site, and 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.
- 11.2** The CONTRACTOR shall comply with all applicable laws, ordinances, rules regulations and orders of any public body having jurisdiction. The CONTRACTOR shall erect and maintain, as required by the conditions and progress of the WORK, all necessary safeguards for safety and protection. The CONTRACTOR will notify owners of adjacent utilities when prosecution of the WORK may affect them. The CONTRACTOR shall remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the CONTRACTOR, any SUBCONTRACTOR or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable to the fault of the CONTRACT DOCUMENTS or to the acts or omissions of the ARCHITECT or OWNER or anyone employed by them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the CONTRACTOR.
- 11.3** In emergencies affecting the safety of persons or the WORK or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the ARCHITECT or OWNER, shall act to prevent threatened damage, injury or loss. The CONTRACTOR shall give the ARCHITECT and OWNER prompt WRITTEN NOTICE of any significant changes in the WORK or deviations from the CONTRACT DOCUMENTS caused thereby, and a CHANGE ORDER shall thereupon be issued covering the changes and deviations involved.
- 11.4** The CONTRACTOR shall confine operations at the PROJECT site to areas permitted by law, ordinances, permits and this AGREEMENT and shall not unreasonably encumber the PROJECT site with materials or equipment.
- 11.5** The CONTRACTOR shall at all times keep the premises free from accumulation of waste materials or rubbish.

## **12. SUPERVISION BY CONTRACTOR**

- 12.1** The CONTRACTOR shall supervise and direct the WORK. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The CONTRACTOR shall employ and maintain on the WORK a qualified

supervisor or superintendent who shall have been designated in writing by the CONTRACTOR as the CONTRACTOR'S representative at the site. The supervisor shall have full authority to act on behalf of the CONTRACTOR, and all communications given to the supervisor shall be as if given to the CONTRACTOR. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the WORK.

### **13. CHANGES IN THE WORK**

- 13.1** The ARCHITECT, UPON the OWNER's approval, may, at any time, as the need arises, order changes within the scope of the WORK without invalidating the Agreement. If such changes increase or decrease the amount due under the CONTRACT DOCUMENTS, or in the time required for performance of the WORK, an equitable adjustment shall be authorized by a CHANGE ORDER.
- 13.2** The ARCHITECT, UPON the OWNER's approval, may, at any time, by issuing a FIELD ORDER, make changes in the details of the WORK. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the ARCHITECT and OWNER unless the CONTRACTOR believes that such FIELD ORDER entitles the CONTRACTOR to a change in CONTRACT PRICE or CONTRACT TIME, or both, in which event the CONTRACTOR shall give the ARCHITECT and OWNER WRITTEN NOTICE thereof within seven (7) days after the receipt of the ordered change. Thereafter, the CONTRACTOR shall document the basis for the change in CONTRACT PRICE or CONTRACT TIME within thirty (30) days. The CONTRACTOR shall not execute such changes pending the receipt of an executed CHANGE ORDER or further instruction from the ARCHITECT and OWNER.

### **14. CHANGES IN CONTRACT PRICE**

- 14.1** The CONTRACT PRICE may be changed only by a CHANGE ORDER. The value of any WORK covered by a CHANGE ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of precedence listed below:
- (A) Unit prices previously approved.
  - (B) An agreed lump sum.
  - (C) The actual cost for labor, direct overhead, materials, supplies, equipment, and other services necessary to complete the WORK.

### **15. TIME FOR COMPLETION AND LIQUIDATED DAMAGES**

- 15.1** The date of beginning and the time for completion of the WORK are essential conditions of the CONTRACT DOCUMENTS and the WORK embraced shall be commenced on a date specified in the written NOTICE TO PROCEED.

- 15.2** The CONTRACTOR shall proceed with the WORK at such rate of progress to ensure full completion within the CONTRACT TIME. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the CONTRACT TIME for the completion of the WORK described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the WORK.
- 15.3** If the CONTRACTOR shall fail to complete the WORK within the CONTRACT TIME, or extension of time granted by the OWNER, then the CONTRACTOR shall pay, to the OWNER, the amount for liquidated damages as specified in Section 3.2 of the AGREEMENT for each calendar day that the CONTRACTOR shall be in default after the time stipulated in the CONTRACT DOCUMENTS.
- 15.4** The CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the WORK is due to the following, and the CONTRACTOR has promptly given WRITTEN NOTICE of such delay to the ARCHITECT and OWNER:
- 15.4.1** To any preference, priority or allocation order duly issued by the ARCHITECT or OWNER;
- 15.4.2** To unforeseeable causes beyond the control, and without the fault or negligence of, the CONTRACTOR, restricted to acts of God or of the public enemy, acts of the ARCHITECT or OWNER, acts of another CONTRACTOR in the performance of a contract with the OWNER, fires, floods, epidemics, quarantine restrictions, strikes and freight embargoes; and
- 15.4.3** To any delays of SUBCONTRACTORS occasioned by any of the causes specified in paragraphs 15.4.1 and 15.4.2 of this article.

## **16. CORRECTION OF WORK**

- 16.1** The CONTRACTOR shall promptly remove from the premises all WORK rejected by the ARCHITECT or OWNER for failure to comply with the CONTRACT DOCUMENTS, whether incorporated in the construction or not, and the CONTRACTOR shall promptly replace and re-execute the WORK in accordance with the CONTRACT DOCUMENTS and without expense to the OWNER and shall bear the expense of making good all WORK of other CONTRACTORS destroyed or damaged by such removal or replacement.
- 16.2** All removal and replacement WORK shall be done at the CONTRACTOR'S expense. If the CONTRACTOR does not take action to remove such rejected WORK within ten (10) days after receipt of WRITTEN NOTICE, the OWNER may remove such WORK and store the materials at the expense of the CONTRACTOR.

## **17. SUBSURFACE CONDITIONS**

**17.1** The CONTRACTOR shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the ARCHITECT and OWNER by WRITTEN NOTICE of:

**17.1.1** Subsurface or latent physical conditions at the site differing materially from those indicated in the CONTRACT DOCUMENTS; or

**17.1.2** Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in WORK of the character provided for in the CONTRACT DOCUMENTS.

**17.2** The ARCHITECT and OWNER will promptly investigate the conditions, and if ARCHITECT and OWNER jointly find that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the WORK, an equitable adjustment will be made and the CONTRACT DOCUMENTS will be modified by a CHANGE ORDER. Any claim of the CONTRACTOR for adjustment hereunder will not be allowed unless the CONTRACTOR has given the required WRITTEN NOTICE, provided that the ARCHITECT and OWNER may, if ARCHITECT and OWNER jointly determine the facts so justify, consider and adjust any such claims asserted before the date of final payment.

## **18. SUSPENSION OF WORK, TERMINATION AND DELAY**

**18.1** The OWNER may suspend the WORK, or any portion thereof, for a period of not more than ninety (90) days, or such further time as agreed upon by the CONTRACTOR, by WRITTEN NOTICE to the CONTRACTOR, which notice will fix the date on which WORK shall be resumed. The CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to any such suspension.

**18.2** If the CONTRACTOR is adjudged as bankrupt or insolvent, or if the CONTRACTOR makes a general assignment for the benefit of the CONTRACTOR'S creditors, or if a trustee or receiver is appointed for the CONTRACTOR or for any of his property, or if the CONTRACTOR files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or if the CONTRACTOR repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if the CONTRACTOR repeatedly fails to make prompt payments to SUBCONTRACTORS or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction of the WORK, or if the CONTRACTOR otherwise violates any provision of the CONTRACT DOCUMENTS, then the OWNER may, without prejudice to any other right or remedy and after giving the CONTRACTOR and the CONTRACTOR'S surety a minimum of twenty (20) days' WRITTEN NOTICE, terminate the services of the CONTRACTOR and take possession of the PROJECT and of all materials, equipment, tools, construction equipment and machinery thereon owned by the CONTRACTOR, and



finish the WORK by whatever method the OWNER may deem expedient. In such case, the CONTRACTOR shall not be entitled to receive any further payment until the WORK is finished. If the unpaid balance of the CONTRACT PRICE exceeds the direct and indirect costs of completing the PROJECT, including compensation for additional professional services, such excess WILL BE PAID TO THE CONTRACTOR. If such costs exceed such unpaid balance, the CONTRACTOR SHALL PAY THE DIFFERENCE TO THE OWNER. Such costs incurred by the OWNER will be incorporated in a CHANGE ORDER. **The OWNER has the right to withhold any such costs incurred by the OWNER from any payments due the CONTRACTOR.**

- 18.3** Where the CONTRACTOR'S services have been so terminated by the OWNER, said termination shall not affect any right of the OWNER against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of monies by the OWNER due the CONTRACTOR will not release the CONTRACTOR from compliance with the CONTRACT DOCUMENTS.
- 18.4** After ten (10) days from delivery of a WRITTEN NOTICE to the CONTRACTOR, the OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the PROJECT and terminate the contract. In such case, the CONTRACTOR will be paid for all WORK executed up to the date of termination.
- 18.5** If, through no act or fault of the CONTRACTOR, the WORK is suspended for a period of more than ninety (90) days by the OWNER, or the WORK is suspended under an order of a court of competent jurisdiction for more than ninety (90) days, or the OWNER fails to pay the CONTRACTOR substantially the sum requested within sixty (60) days of approval and receipt of a request for payment by the OWNER, then the CONTRACTOR may, after thirty (30) days from delivery of a WRITTEN NOTICE to the OWNER, such thirty (30) day WRITTEN NOTICE also giving the OWNER an opportunity to cure any default, terminate the CONTRACT and recover from the OWNER payment for all WORK executed up to the date of termination. In addition and in lieu of terminating the CONTRACT, if the OWNER has failed to make any payment as aforesaid, the CONTRACTOR may, upon twenty (20) days WRITTEN NOTICE to the OWNER, stop the WORK until the CONTRACTOR has been paid all amounts then due, in which event and upon resumption of the WORK, CHANGE ORDERS shall be issued for adjusting the CONTRACT PRICE or extending the CONTRACT TIME, or both, to compensate for the costs and delays attributable to the stoppage of the WORK.
- 18.6** If, through no act or fault of the CONTRACTOR, the performance of all or any portion of the WORK is suspended, delayed, or interrupted as a result of a failure of the OWNER to act within the time specified in the CONTRACT DOCUMENTS, including default cure time periods, or if no time is specified, within a reasonable time, an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, will be made by CHANGE ORDER to compensate the CONTRACTOR for the costs and delays directly caused by the failure of the OWNER.

## 19. PAYMENTS TO CONTRACTOR

- 19.1** At least ten (10) days before each progress payment falls due, but not more often than once a month, the CONTRACTOR shall submit to the ARCHITECT a Partial Payment Estimate filled out and signed by the CONTRACTOR covering the WORK performed during the period covered by the Partial Payment Estimate and supported by such data as the ARCHITECT or OWNER may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the WORK but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the ARCHITECT and OWNER, as will establish the OWNER'S title to the material and equipment and protect the OWNER'S interest therein, including applicable insurance. The ARCHITECT will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing the ARCHITECT'S approval of payment, or return the partial payment estimate to the CONTRACTOR indicating, in writing, the reasons for refusing to approve payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the partial payment estimate. The OWNER will, within thirty (30) days of presentation to the OWNER of an approved partial payment estimate, pay the CONTRACTOR a progress payment on the basis of the approved partial payment estimate. In accordance with Ark. Code Ann. § 22-9-604, the ~~ARCHITECT-OWNER~~ will retain five percent (5%) of the earned amount of the WORK progress shown on the partial payment estimate, excluding materials and equipment on hand but not installed, ~~and upon certification by the ARCHITECT that the WORK progress is fifty percent (50%) complete, based on the adjusted contract price, there will be no additional retainage on account of WORK completed, in which case the remaining progress payments prior to SUBSTANTIAL COMPLETION will be in an amount equal to one hundred percent (100%) of the WORK completed.~~ Further, if the Contract Document allow for phased work in which completion may occur on a partial occupancy, any retention proceeds withheld and retained under the Contract Documents shall be partially released within thirty (30) days under the same conditions under the Contract Documents in direct proportion to the value of the part of the capital improvement completed. Upon certification of SUBSTANTIAL COMPLETION of the WORK, the retained amount may be reduced to only that amount necessary to assure completion. On completion and acceptance of a part of the WORK on which the price is stated separately in the CONTRACT DOCUMENTS, payment may be made in full, including retained percentages, less authorized deductions. All sums withheld by the Owner shall be paid to the Contractor within thirty (30) days after the construction contract has been completed.
- 19.2** The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at or near the site.
- 19.3** Prior to SUBSTANTIAL COMPLETION, the OWNER may use any completed or substantially completed portions of the WORK. Such use shall not constitute an acceptance of such portions of the WORK.

- 19.4** The OWNER will have the right to enter the premises for the purpose of doing work not covered by the CONTRACT DOCUMENTS. This provision shall not be construed as relieving the CONTRACTOR of the sole responsibility for the care and protection of the WORK, or the restoration of any damaged WORK, except such as may be caused by agents or employees of the OWNER.
- 19.5** Upon completion and acceptance of the WORK, and after the receipt of all lien waivers and other proper documentation from the CONTRACTOR, the OWNER will sign the final payment request as its certification that the WORK has been accepted by the OWNER under the conditions of the CONTRACT DOCUMENTS. The entire balance found to be due the CONTRACTOR, including the retained percentages, but except such sums as may be lawfully retained by the OWNER, will be paid to the CONTRACTOR within thirty (30) days of completion and final acceptance of the WORK by the OWNER.
- 19.6** The CONTRACTOR shall indemnify and save the ARCHITECT and OWNER, or the ARCHITECT'S and OWNER'S agents, harmless from all claims growing out of the lawful demands of SUBCONTRACTORS, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the WORK. The CONTRACTOR shall furnish the OWNER and ARCHITECT satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the CONTRACTOR fails to do so, the OWNER may, after having notified the CONTRACTOR, either pay unpaid bills or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, where upon payment to the CONTRACTOR shall be resumed, in accordance with the terms of the CONTRACT DOCUMENTS, but in no event shall the provisions of this sentence be construed to impose any obligations upon the ARCHITECT or OWNER to either the CONTRACTOR, his Surety, or any third party. In paying any unpaid bills of the CONTRACTOR, any payment, so made by the OWNER shall be considered as a payment made under the CONTRACT DOCUMENTS by the OWNER to the CONTRACTOR and the OWNER will not be liable to the CONTRACTOR for any such payments made in good faith.
- 19.7** The CONTRACTOR warrants that upon submittal of a request for payment, all work for which payment has been received by the CONTRACTOR shall be free and clear of liens, claims, security interests or encumbrances in favor of the CONTRACTOR, subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials or equipment relating to the work or project.
- 19.8** Any payment to the CONTRACTOR by the OWNER, final or otherwise, shall not constitute an acceptance of any WORK not in accordance with the CONTRACT DOCUMENTS.

## **20. ACCEPTANCE OF FINAL PAYMENT AS RELEASE**

- 20.1** The acceptance by the CONTRACTOR of final payment shall be and shall operate as a release to the OWNER of all claims and all liability to the CONTRACTOR, other than claims in stated amounts as may be specifically excepted by the CONTRACTOR, for all things done or furnished in connection with this WORK and for every act and neglect of the OWNER and others relating to, or arising out of, this WORK. Any payment, however, final or otherwise, will not release the CONTRACTOR or his sureties from any obligations under the CONTRACT DOCUMENTS or the Performance BOND and Payment BOND.

## **21. INSURANCE**

- 21.1** Contractor's Liability Insurance: CONTRACTOR shall purchase and maintain, in a company or companies licensed to do business in the State of Arkansas, such commercial general liability and other insurance as is appropriate for the WORK being performed and furnished and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR'S performance and furnishing of the WORK and CONTRACTOR'S other obligations under the CONTRACT DOCUMENTS, whether it is to be performed or furnished by CONTRACTOR, by any Subcontractor, by anyone directly or indirectly employed by any of them to perform or furnish any of the WORK, or by anyone for whose acts any of them may be liable:
- 21.1.1** Claims under workers or workmen's compensation, disability benefits, and other similar employee benefit acts;
  - 21.1.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR'S employees;
  - 21.1.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR'S employees;
  - 21.1.4** Claims for damages insured by personal injury liability coverage which are sustained (a) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (b) by any other person for any other reason;
  - 21.1.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom;
  - 21.1.6** Claims arising out of operation of Laws or Regulations for damages because of bodily injury or death of any person or for damage to property;
  - 21.1.7** 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; and

- 21.1.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Article 24.
- 21.2** The insurance required by paragraph 21.1 shall include the specific coverages and be written for not less than the limits of liability and coverages provided in the SUPPLEMENTARY CONDITIONS, or required by law, whichever is greater. All such insurance shall remain in effect until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replacing defective WORK in accordance with paragraph 28.1. In addition, CONTRACTOR shall maintain completed operations insurance for at least one (1) year after date of final completion and furnish OWNER with evidence of continuation of such insurance at final completion.
- 21.3** The CONTRACTOR shall purchase and maintain in the name of the ARCHITECT and OWNER an Owner's and Contractor's Protective Liability Policy as will protect the ARCHITECT and OWNER against claims which may arise from operations under the contract. Coverage shall not exceed coverage of CONTRACTOR'S Commercial General Liability policy.
- 21.4** The CONTRACTOR shall acquire and maintain, if applicable, Fire and Extended Coverage insurance upon the PROJECT to the full insurable value thereof for the benefit of the OWNER, the CONTRACTOR, and SUBCONTRACTORS as their interest may appear. This provision shall in no way release the CONTRACTOR or CONTRACTOR'S surety from obligations under the CONTRACT DOCUMENTS to fully complete the PROJECT.
- 21.5** The CONTRACTOR shall procure and maintain, at the CONTRACTOR'S own expense, during the CONTRACT TIME, in accordance with the provisions of the laws of the state in which the WORK is performed, Workers' Compensation Insurance, including occupational disease provisions, for all of CONTRACTOR'S employees at the site of the PROJECT and in case any work is sublet, the CONTRACTOR shall require such SUBCONTRACTOR similarly to provide Workers' Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the CONTRACTOR. In case any class of employees engaged in hazardous work under this AGREEMENT at the site of the PROJECT is not protected under Workers' Compensation statute, the CONTRACTOR shall provide, and shall cause each SUBCONTRACTOR to provide, adequate and suitable insurance for the protection of his employees not otherwise protected.
- 21.6** Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates and the insurance policies required by Paragraph 21.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least thirty (30) days' prior written notice has been given to the Owner.

## **22. CONTRACT SECURITY**

**22.1** The CONTRACTOR shall, within ten (10) days after the receipt of the NOTICE OF AWARD, furnish the OWNER with a Performance BOND and a Payment BOND, each in penal sums equal to the amount of the CONTRACT PRICE, conditioned upon the performance by the CONTRACTOR of all undertakings, covenants, terms, conditions and agreements of the CONTRACT DOCUMENTS, and upon the prompt payment by the CONTRACTOR to all persons supplying labor and materials in the prosecution of the WORK provided by the CONTRACT DOCUMENTS. Such BONDS shall be executed by the CONTRACTOR and a corporate bonding company licensed to transact such business in the state in which the WORK is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these BONDS shall be borne by the CONTRACTOR. If, at any time, a surety on any such BOND is declared a bankrupt or loses its right to do business in the state in which the WORK is to be performed or is removed from the list of "Surety Companies Acceptable on Federal Bonds," CONTRACTOR shall, within ten (10) days after notice from the OWNER to do so, substitute an acceptable BOND (or BONDS) in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such BOND shall be paid by the CONTRACTOR. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable BOND to the OWNER.

### **23. ASSIGNMENTS**

**23.1** Neither the CONTRACTOR nor the OWNER shall sell, transfer, assign or otherwise dispose of this AGREEMENT, the CONTRACT DOCUMENTS, or any portion thereof, or of the right, title or interest therein, or any obligation thereunder, without written consent of the other party.

### **24. INDEMNIFICATION**

**24.1** The CONTRACTOR shall indemnify and hold harmless the OWNER, and their agents and employees, from and against all claims, damages, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the WORK, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including the loss of use resulting therefrom, and is caused in whole or in part by any negligent or willful act or omission of the CONTRACTOR, any SUBCONTRACTOR, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable.

**24.2** In any and all claims against the OWNER, or any of their agents or employees, by any employee of the CONTRACTOR, any SUBCONTRACTOR, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation of benefits payable by or for the CONTRACTOR or any SUBCONTRACTOR under workmen's compensation acts, disability benefit acts or other employee benefits acts.

**24.3** CONTRACTOR hereby releases, indemnifies and holds harmless the OWNER, its officers, agents and employees from and against any and all loss, damage and expense including, but not limited to; any claim, demand or action for injury, liability or damage to persons or property or, for loss of life; and any and all claims or actions brought by any person, firm, government body or other entity, resulting from, arising from or in connection with contamination of, or threatened contamination of, or adverse effects on, the environment, or violation of any environmental or other statute, ordinance, rule, regulation, order, permit or judgment of any government or judicial entity; and from and against any damages, liabilities, costs, fees, fines, charges, causes of action, law suits, judgments and penalties assessed, including, but not limited to, reasonable investigation and legal expenses in connection with defending any such action, arising from any matter or circumstance on the property regarding the performance of the Work and services under the Agreement between the CONTRACTOR, its officers, agents, employees and assigns, and the OWNER for Work and services provided to the OWNER pursuant to such Agreement.

To evidence proper disposal of all solid waste associated with the Work performed under said Agreement in a legally permitted solid waste disposal facility, CONTRACTOR will provide the OWNER with a receipt for each dump load of solid waste so disposed.

**24.4** The obligation of the CONTRACTOR under this paragraph shall not extend to the liability of the ARCHITECT, its agents or employees, arising out of the preparation or approval of maps, DRAWINGS, opinions, reports, surveys, CHANGE ORDERS, designs or SPECIFICATIONS.

## **25. SEPARATE CONTRACTS**

**25.1** The OWNER reserves the right to let separate contracts for this PROJECT. The CONTRACTOR shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their WORK, and shall properly connect and coordinate its WORK with theirs. If the proper execution or results of any part of the CONTRACTOR'S WORK depends upon the WORK of any other contractor, the CONTRACTOR shall inspect and promptly report to the ARCHITECT and OWNER any defects in such WORK that render it unsuitable for such proper execution and results.

**25.2** The OWNER may perform additional WORK related to the PROJECT itself, or the OWNER may let other contracts containing provisions similar to these CONTRACT DOCUMENTS. The CONTRACTOR will afford the other contractors who are parties to such contracts, or the OWNER if the OWNER is performing the additional WORK, reasonable opportunity for the introduction and storage of materials and equipment and the execution of WORK, and shall properly connect and coordinate his WORK with theirs.

**25.3** If the performance of additional WORK by other contractors or the OWNER is not noted in the CONTRACT DOCUMENTS prior to the execution of the CONTRACT, WRITTEN NOTICE thereof shall be given by the OWNER to the CONTRACTOR prior to starting any

such additional WORK. If the CONTRACTOR believes that the performance of such additional WORK by the OWNER or others involves additional expense to the CONTRACTOR, or entitles the CONTRACTOR to an extension of the CONTRACT TIME, the CONTRACTOR may make a claim therefor as provided in Sections 14 and 15.

## **26. SUBCONTRACTING**

- 26.1** The CONTRACTOR may utilize the services of specialty SUBCONTRACTORS on those parts of the WORK which, under normal contracting practices, are performed by specialty SUBCONTRACTORS.
- 26.2** All SUBCONTRACTORS and material suppliers utilized on this Project shall be experienced in the type of work required by the Project, reputable, qualified and shall be acceptable to the OWNER.
- 26.3** The CONTRACTOR shall be fully responsible to the OWNER for the acts and omissions of the CONTRACTOR'S SUBCONTRACTORS and material suppliers on this PROJECT, and of persons either directly or indirectly employed by them, as the CONTRACTOR is for the acts and omissions of persons directly employed by the CONTRACTOR.
- 26.4** The CONTRACTOR shall cause appropriate provisions to be inserted in all subcontracts relative to the WORK to bind SUBCONTRACTORS to the CONTRACTOR by the terms of the CONTRACT DOCUMENTS insofar as applicable to the WORK of SUBCONTRACTORS, and to give the CONTRACTOR the same power as regards terminating any subcontract that the OWNER may exercise over the CONTRACTOR under any provision of the CONTRACT DOCUMENTS.
- 26.5** Nothing contained in the CONTRACT DOCUMENTS will create any contractual relationship between any SUBCONTRACTOR or material supplier and the OWNER.

## **27. LAND AND RIGHTS-OF-WAY**

- 27.1** Prior to issuance of NOTICE TO PROCEED, the OWNER will obtain all land and rights-of-way necessary for carrying out and for the completion of the WORK to be performed pursuant to the CONTRACT DOCUMENTS, unless otherwise mutually agreed.
- 27.2** The OWNER will provide to the CONTRACTOR information which delineates and describes the lands owned and rights-of-way acquired.
- 27.3** The CONTRACTOR shall provide at the CONTRACTOR'S own expense and without liability to the OWNER any additional land and access thereto that the CONTRACTOR may desire for temporary construction facilities, or for storage of materials.

## **28. GUARANTY**



**28.1** The CONTRACTOR shall guarantee all materials and equipment furnished and WORK performed for a period of one (1) year from the date of SUBSTANTIAL COMPLETION. The CONTRACTOR warrants and guarantees, for a period of one (1) year from the date of SUBSTANTIAL COMPLETION of the system and PROJECT, that the completed system and PROJECT are free from all defects due to faulty materials or workmanship, and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects, including the repairs of any damage to other parts of the system or PROJECT resulting from such defects. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other WORK that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Performance BOND shall remain in full effect throughout the guarantee period.

## **29. TAXES**

**29.1** The CONTRACTOR shall pay all sales, consumer, use and other similar taxes required by the law of the place where the WORK is performed.

## **30. ARCHITECT'S RESPONSIBILITIES**

**30.1** The ARCHITECT will act as the OWNER'S representative during the construction period. The ARCHITECT will jointly decide with the OWNER questions which may arise as to quality and acceptability of materials furnished and WORK performed. The ARCHITECT and the OWNER will jointly interpret the intent of the CONTRACT DOCUMENTS in a fair and unbiased manner. The ARCHITECT or OWNER will make visits to the site and determine if the WORK is proceeding in accordance with the CONTRACT DOCUMENTS.

**30.2** The CONTRACTOR will be held strictly to the intent of the CONTRACT DOCUMENTS in regard to the quality of materials, workmanship, and execution of the WORK. Inspections may be made at the factory or fabrication plant of the source of material supply.

**30.3** The ARCHITECT will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

**30.4** The ARCHITECT and OWNER will jointly make prompt decisions relative to interpretation of the CONTRACT DOCUMENTS.

**END OF DOCUMENT**

**This page was intentionally left blank for duplex printing.**

**SECTION 00 73 43**  
**WAGE RATE REQUIREMENTS**

**PART 1 - GENERAL**

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**3.01 EXECUTION**

- A. All work shall be compensated at a level not less than that established by the Arkansas Prevailing Wage Law.
- B. Contractor shall submit a "Statement of Intent to Pay Prevailing Wages" to the Arkansas Department of Labor within 30 days after notice to proceed.
- C. The scale of wages shall be posted by the Contractor in a prominent and easily accessible place at the work site.
- D. Comply with applicable administrative and reporting requirements.
- E. A copy of the prevailing wage determination follows after the end of this section.
- F. Contractor shall request a determination of prevailing wage rate for any omitted classifications that are required for this project.
  - 1. A copy of "Request For Determination Of Prevailing Wage Rates - Omitted Classifications," Form ARK PW-2, follows after the end of this section.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



STATE OF ARKANSAS  
ARKANSAS DEPARTMENT OF LABOR  
PREVAILING WAGE DIVISION

10421 WEST MARKHAM • LITTLE ROCK, AR 72205-2190  
Phone: 501-682-4536 Fax: 501-682-4508 TRS: 800-285-1131

February 12, 2015

Mark Littrell  
Cromwell Architects Engineers Inc  
101 S Spring St  
Little Rock, AR 72201-2490

Re: CITY OF LITTLE ROCK - ANIMAL  
VILLAGE INCINERATOR  
LITTLE ROCK, ARKANSAS  
PULASKI COUNTY

Dear Mr. Littrell:

In response to your request, enclosed is Arkansas Prevailing Wage Determination Number **14-385** establishing the minimum wage rates to be paid on the above-referenced project. These rates were established pursuant to the Arkansas Prevailing Wage Law, Ark. Code Ann. §§ 22-9-301 to 22-9-315 and the administrative regulations promulgated thereunder.

If the work is subject to the Arkansas Prevailing Wage Law, every specification shall include minimum prevailing wage rates for each craft or type of worker as determined by the Arkansas Department of Labor Ark. Code Ann. § 22-9-308 (b) (2). Also, the public body awarding the contract shall cause to be inserted in the contract a stipulation to the effect that not less than the prevailing hourly rate of wages shall be paid to all workers performing work under the contract. Ark. Code Ann. § 22-9-308 (c).

Additionally, the scale of wages shall be posted by the contractor in a prominent and easily accessible place at the work site. Ark. Code Ann. § 22-9-309 (a).

Also enclosed is a "**Statement of Intent to Pay Prevailing Wages**" form that should be put in your specifications along with the wage determination. The General/Prime Contractor is responsible for getting this form filled out and returned to this office within 30 days of the Notice to Proceed for this project.

***When you issue the Notice to Proceed for this project, please send a copy of the notice to my office.***

If you have any questions, please call me at (501) 682-4536 or fax (501) 682-4508.

Sincerely,

A handwritten signature in cursive script that reads "Lorna Kay Smith".

Lorna K. Smith  
Prevailing Wage Division

Enclosures

# Arkansas Department of Labor Prevailing Wage Determination

Date: 2/12/2015

Determination #: 14-385

Expires: 8/12/2015

Project: City of Little Rock - Animal Village Incinerator

Site:

City: Little Rock, Arkansas

Project County: Pulaski

Survey#: 714-AR01

COUNTY(S)	Group
Pulaski	1
Saline	

CLASSIFICATION	Basic Hourly Rate	Fringe Benefits
Asbestos Worker/Insulator	\$13.30	\$1.29
Boilermaker	\$17.78	\$5.04
Bricklayer/Pointer, Cleaner, Caulker, Stone Mason	\$21.20	
Carpenter	\$17.25	
Concrete Finisher/Cement Mason	\$15.80	
Elevator Mechanic	\$24.30	\$12.18
Glazier	\$15.20	\$2.90
HVACR Mechanic (Excludes Duct Work)	\$18.00	\$0.90
Ironworker (Including Reinforcing Work)	\$19.85	
Laborer	\$12.00	
Marble/Tile/Terrazzo	\$25.00	
Metal Building Erector	\$13.25	
Millwright	\$21.30	\$7.71
Painter/Sheet Rock Finisher	\$13.05	
Pipelayer	\$12.50	\$1.09
Plasterer	\$15.00	\$3.70
Plumber/Pipefitter	\$20.80	\$8.42
Roofer	\$16.55	\$1.35
Sheet Metal (Includes Duct Work)	\$18.35	\$5.60
Soft Floor Layer	\$12.00	
Sprinkler Fitter	\$22.95	\$2.85
Waterproofer	\$14.15	\$1.15
Group 1 - Operator	\$15.00	
Group 2 - Operator	\$15.70	\$3.51
Group 3 - Operator	\$12.00	
Group 4 - Operator	\$15.15	
Laborer (Brick/Stone Tender)	\$12.00	
Low Voltage/Alarm Installer	\$17.15	\$3.05
Truck Driver (Excludes Dump Truck)	\$13.00	
Electrician	\$23.54	\$10.16

Welders-receive rate prescribed for craft performing operation to which welding is incidental.

**Certified 7/1/2014**

***Classifications that are required, but not listed above, must be requested in writing from the Arkansas Department of Labor, Prevailing Wage Division. Please call (501) 682-4536 for a request form.***

## **Power Equipment Operators:**

### **Group I**

Operators engaged in operating the following equipment: Cranes, draglines, shovels and piledrivers with a lifting capacity of 50 tons or over, and operators of all tower climbing cranes and derricks required to work 25 feet or over from the ground, blacksmith and mechanics.

### **Group II**

Operators engaged in operating the following equipment or performing work relative to the engineer's jurisdiction: Hydraulic cranes, cherry pickers, backhoes, and all derricks with a lifting capacity less than 50 tons, as specified by the manufacturer, all backhoes, tractor or truck type, all overhead & traveling cranes, or tractors with swinging boom attachments, gradealls all above equipment irrespective of motive power, leverman (engineer), hydraulic or bucket dredges, irrespective of size, trackhoes, excavators.

### **Group III**

Heavy Equipment Operators. Operators engaged in operating the following equipment: all bulldozers, all front end loaders, all sidebooms, skytracks, forklifts, all push tractors, all pull scrapers, all motor graders, all trenching machines, regardless of size or motive power, all backfillers, all central mixing plants, 10S and larger, finishing machines, all boiler fireman high or low pressure, all asphalt spreaders, hydro truck crane, multiple drum hoist, irrespective of motive power, all rotary, cable tool, core drill or churn drill, water well and foundation drilling machines, regardless of size, regardless of motive power and dredge tender operator, asphalt paving machines.

### **Group IV**

Light Equipment Operators. Operators engaged in operating the following equipment: Oilerdriver motor crane, single drum hoists, winches and air tuggers, irrespective of motive power, winch or A frame trucks, rollers of all types and pull tractors, regardless of size, elevator operators inside and outside when used for carrying workmen from floor to floor and handling building material, Lad-A-Vator Conveyor, batch plant, and mortar or concrete mixers, below 10S, end dump euclid, pumpcrete spray machine and pressure grout machine, air compressors, regardless of size. All light equipment, welding machines, light plants, pumps, all well point system dewatering and portable pumps, space heaters, irrespective of size, and motive power, equipment greaser, oiler, mechanic helper, drilling machine helper, asphalt distributor and like equipment, safety boat operator and deckhand.

**STATEMENT OF INTENT TO PAY PREVAILING WAGES**

PROJECT: **CITY OF LITTLE ROCK - ANIMAL VILLAGE INCINERATOR  
LITTLE ROCK, ARKANSAS  
PULASKI COUNTY**

This is to certify that we, the following listed contractors, are aware of the wage requirements of the Arkansas Prevailing Wage Law and by signature below indicate our intent to pay no less than the rates established by **Arkansas Prevailing Wage Determination Number 14-385** for work performed on the above noted public project. I understand that contractors who violate prevailing wage laws, i.e., incorrect classification/scope of work of workers, improper payments of prevailing wages, etc., are subject to fines and will be required to pay back wages due to workers.

	<b>Business Name</b>	<b>Address</b>	<b>Phone#</b>	<b>Signature and Title of Business Official</b>
General/Prime Contractor				
Electrical Subcontractor				
Mechanical Subcontractor				
Plumbing Subcontractor				
Roofing/ Sheet Metal Subcontractor				

THE GENERAL/PRIME CONTRACTOR IS RESPONSIBLE FOR GETTING THIS FORM FILLED OUT AND RETURNING IT TO THE ARKANSAS DEPARTMENT OF LABOR ***WITHIN 30 DAYS OF THE NOTICE TO PROCEED*** FOR THIS PROJECT. RETURN COMPLETED FORM TO THE ARKANSAS DEPARTMENT OF LABOR, PREVAILING WAGE DIVISION, 10421 W. MARKHAM, LITTLE ROCK, ARKANSAS, 72205.



**ARKANSAS DEPARTMENT OF LABOR  
10421 West Markham  
Little Rock, AR 72205-2190  
(501) 682-4536 OR 682-4599 TELEPHONE OR (501) 682-4508 FAX**

**REQUEST FOR DETERMINATION OF PREVAILING WAGE RATES**

**OMITTED CLASSIFICATIONS**

**DATE OF REQUEST:**

**NAME OF INQUIRER:**

**COMPANY NAME:**

**MAILING ADDRESS:**

**TELEPHONE NUMBER/FAX NUMBER:**

**PREVAILING WAGE DETERMINATION NUMBER :**

**TITLE OF PROJECT:**

**LOCATION OF PROJECT (city & county):**

**List all classifications omitted from the initial wage determination & a brief description of the duties performed:**

**This page was intentionally left blank for duplex printing.**

**SECTION 01 10 00**  
**SUMMARY**

**PART 1 GENERAL**

**1.01 CONTRACT DESCRIPTION**

- A. Contract Type: A single prime contract based on a Stipulated Price.

**1.02 DESCRIPTION OF ALTERATIONS WORK**

- A. Scope of work is indicated on drawings. Where indicated new work to match existing.

**1.03 WORK BY OWNER**

- A. Owner will supply and install the following:
- B. Owner will supply the following for installation by Contractor:

**1.04 OWNER OCCUPANCY**

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Owner intends to occupy the Project upon Substantial Completion.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

**1.05 CONTRACTOR USE OF SITE AND PREMISES**

- A. Construction Operations: Limited to the immediate Work area and as directed by Owner and Architect Engineer.
- B. Arrange use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Use of site and premises by the public.
- C. Provide access to and from site as required by law and by Owner:
  - 1. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Existing building spaces may not be used for storage.
- E. Time Restrictions:
  - 1. Owner's normal business hours are 8:00 AM - 5:00 PM.
  - 2. On site Work shall be limited to actual time period necessary for completion of construction without interruption or delay.
  - 3. On site Work shall not commence until all submittals have been approved and all materials required to complete the Work are stored locally and are immediately available.
- F. Utility Outages and Shutdown:
  - 1. Limit shutdown of utility services to 4 hours at a time, arranged at least 24 hours in advance with Owner.
  - 2. Prevent accidental disruption of utility services to other facilities.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 01 20 00**  
**PRICE AND PAYMENT PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

**1.02 SCHEDULE OF VALUES**

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect Engineer for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate within 20 days after date of Owner-Contractor Agreement.
- D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization.
- E. Include within each line item, a direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

**1.03 APPLICATIONS FOR PROGRESS PAYMENTS**

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect Engineer for approval.
- C. Forms filled out by hand will not be accepted.
- D. For each item, provide a column for listing each of the following:
  - 1. Item Number.
  - 2. Description of work.
  - 3. Scheduled Values.
  - 4. Previous Applications.
  - 5. Work in Place and Stored Materials under this Application.
  - 6. Authorized Change Orders.
  - 7. Total Completed and Stored to Date of Application.
  - 8. Percentage of Completion.
  - 9. Balance to Finish.
  - 10. Retainage.
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- H. Submit three copies of each Application for Payment.
- I. Include the following with the application:
  - 1. Transmittal letter as specified for Submittals in Section 01 30 00.
  - 2. Construction progress schedule, revised and current as specified in Section 01 30 00.
  - 3. Current construction photographs specified in Section 01 30 00.
  - 4. Partial release of liens from major Subcontractors and vendors.

5. Project record documents as specified in Section 01 78 00, for review by Owner which will be returned to the Contractor.
  6. Affidavits attesting to off-site stored products.
- J. When Architect Engineer requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

#### **1.04 MODIFICATION PROCEDURES**

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect Engineer will issue instructions directly to Contractor.
- C. For changes for which advance pricing is desired, Architect Engineer will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 5 days.
- D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
  1. For change requested by Architect Engineer for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
  2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect Engineer.
  3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
- E. Substantiation of Costs: Provide full information required for evaluation.
  1. Provide following data:
    - a. Quantities of products, labor, and equipment.
    - b. Taxes, insurance, and bonds.
    - c. Overhead and profit.
    - d. Justification for any change in Contract Time.
    - e. Credit for deletions from Contract, similarly documented.
- F. Execution of Change Orders: Architect Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- I. Promptly enter changes in Project Record Documents.

#### **1.05 APPLICATION FOR FINAL PAYMENT**

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
  1. All closeout procedures specified in Section 01 70 00.

#### **PART 2 PRODUCTS - NOT USED**

#### **PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 01 30 00**  
**ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information, and project closeout.
- F. Submittal procedures.
- G. Request for information.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.
- B. Section 01 33 00 - Submittal Procedures.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PRECONSTRUCTION MEETING**

- A. Architect Engineer will schedule a meeting after Notice of Award.
- B. Attendance Required:
  - 1. Owner.
  - 2. Architect Engineer.
  - 3. Contractor.
- C. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
  - 5. Designation of personnel representing the parties to Contract and Architect Engineer.
  - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect Engineer, Owner, participants, and those affected by decisions made.

**3.02 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems that impede, or will impede, planned progress.

5. Review of submittals schedule and status of submittals.
  6. Review of off-site fabrication and delivery schedules.
  7. Maintenance of progress schedule.
  8. Corrective measures to regain projected schedules.
  9. Planned progress during succeeding work period.
  10. Coordination of projected progress.
  11. Maintenance of quality and work standards.
  12. Effect of proposed changes on progress schedule and coordination.
  13. Other business relating to Work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect Engineer, Owner, participants, and those affected by decisions made.

### **3.03 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16**

#### **3.04 SUBMITTALS FOR REVIEW**

- A. When the following are specified in individual sections, submit them for review:
1. Product data.
  2. Shop drawings.
  3. Samples for selection.
  4. Samples for verification.
  5. Submittals as requested by Architect Engineer.
  6. Other types as indicated.
- B. Submit to Architect Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

#### **3.05 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
1. Design data.
  2. Certificates.
  3. Test reports.
  4. Inspection reports.
  5. Manufacturer's instructions.
  6. Manufacturer's field reports.
  7. Other types indicated.
- B. Submit for Architect Engineer's knowledge as contract administrator or for Owner. No action will be taken.

#### **3.06 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. When the following are specified in individual sections or otherwise required, submit them at project closeout:
1. Project record documents.
  2. Operation and maintenance data.
  3. Warranties.
  4. Bonds.
  5. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.



**3.07 SUBMITTAL PROCEDURES -- SEE SECTION 01 33 00 - SUBMITTAL PROCEDURES**

**3.08 REQUEST FOR INFORMATION**

- A. Use AIA Document G716-2004 Request for Information. A copy follows the end of this section.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



# AIA<sup>®</sup> Document G716<sup>™</sup> – 2004

## Request for Information (“RFI”)

TO:

FROM:

PROJECT:

ISSUE DATE:

RFI No. 001

PROJECT NUMBERS: /

REQUESTED REPLY DATE:

COPIES TO:

**RFI DESCRIPTION:** *(Fully describe the question or type of information requested.)*

**REFERENCES/ATTACHMENTS:** *(List specific documents researched when seeking the information requested.)*

**SPECIFICATIONS:**

**DRAWINGS:**

**OTHER:**

**SENDER’S RECOMMENDATION:** *(If RFI concerns a site or construction condition, the sender may provide a recommended solution, including cost and/or schedule considerations.)*

**RECEIVER’S REPLY:** *(Provide answer to RFI, including cost and/or schedule considerations.)*

BY

DATE

COPIES TO

**Note:** This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order, Construction Change Directive or a Minor Change in the work must be executed in accordance with the Contract Documents.

**This page was intentionally left blank for duplex printing.**

**SECTION 01 32 16**  
**CONSTRUCTION PROGRESS SCHEDULE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

**1.02 REFERENCES**

- A. AGC (CPSM) - Construction Planning and Scheduling Manual; Associated General Contractors of America; 2004.

**1.03 SUBMITTALS**

- A. Within 7 days after date established in Notice to Proceed, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.
- F. Submit under transmittal letter form specified in Section 01 30 00.

**1.04 SCHEDULE FORMAT**

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: Maximum 22 x 17 inches or width required.
- C. Scale and Spacing: To allow for notations and revisions.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

**3.02 CONTENT**

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Provide sub-schedules to define critical portions of the entire schedule.
- D. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- E. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect Engineer. Indicate decision dates for selection of finishes.
- F. Coordinate content with schedule of values specified in Section 01 20 00.
- G. Provide legend for symbols and abbreviations used.

**3.03 BAR CHARTS**

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

**3.04 REVIEW AND EVALUATION OF SCHEDULE**

- A. Participate in joint review and evaluation of schedule with Architect Engineer at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

**3.05 UPDATING SCHEDULE**

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Update diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.
- G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

**3.06 DISTRIBUTION OF SCHEDULE**

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect Engineer, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

**END OF SECTION**

**SECTION 01 33 00**  
**SUBMITTAL PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

**1.02 RELATED SECTIONS INCLUDE**

- A. Section 01 30 00 - Administrative Requirements.
- B. Section 01 60 00 - Product Requirements: Submitting substitution requests.
- C. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

**1.03 DEFINITIONS**

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

**1.04 SUBMITTAL PROCEDURES**

- A. Transmit submittals to Architect Engineer for delivery to Owner.
- B. General: Electronic pdf or live copies of 2-D CAD Drawings of the Contract Drawings may be obtained from Architect Engineer upon payment of a fee (at standard rates) for Contractor's use in preparing submittals, unless otherwise indicated. Contact [printshop@cromwell.com](mailto:printshop@cromwell.com).
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
  - 3. Submittals for finishes and colors shall be coordinated and submitted at the same time.
- D. Basis Of Design:
  - 1. Products indicated in the color and finish schedules or drawing notes; including color, shade, hue, translucence, opacity, pattern, or texture; establish the Basis of Design. Use the Basis of Design. Submit a request for substitution for any product not indicated.
  - 2. Substitutions will not be considered for finishes and colors unless all finishes and colors are coordinated and submitted together.
- E. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Schedule" for list of submittals and time requirements for scheduled performance of related construction activities.
- F. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with other Contractors and/or subsequent submittals is required. Architect Engineer will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect Engineer's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- G. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect Engineer.
  3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Architect Engineer's project number.
    - c. Owner's project number.
    - d. Date.
    - e. Name and address of architect.
    - f. Name and address of contractor.
    - g. Name and address of subcontractor.
    - h. Name and address of supplier.
    - i. Name of manufacturer.
    - j. Submittal number or other unique identifier, including revision identifier.
      - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    - k. Number and title of appropriate Specification Section.
    - l. Drawing number and detail references, as appropriate.
    - m. Location(s) where product is to be installed, as appropriate.
    - n. Other necessary identification.
- H. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- I. Copies: Minimum one hard copy and electronic file. Hard copy and electronic file shall be identical. In addition, provide number of hard copies indicated in individual technical sections.
- J. Additional Copies: Unless additional copies are required for final submittal, and unless Architect Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect Engineer.
  2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.
- K. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect Engineer will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Use form acceptable to Architect Engineer.
  2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- L. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are approved.



- M. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- N. Use for Construction: Use only final submittals with mark indicating "No Exceptions Taken" by Architect Engineer.

## **PART 2 PRODUCTS**

### **2.01 ACTION SUBMITTALS**

- A. General: Prepare and submit Action Submittals indicated or subsequently requested by Architect Engineer.
- B. Submittals for "Match Existing": Where Work is indicated to "Match Existing" provide submittals for Architect Engineer approval prior to ordering materials.
- C. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.
    - f. Wiring diagrams showing factory-installed wiring.
    - g. Printed performance curves.
    - h. Operational range diagrams.
    - i. Mill reports.
    - j. Standard product operation and maintenance manuals.
    - k. Compliance with specified referenced standards.
    - l. Testing by recognized testing agency.
    - m. Application of testing agency labels and seals.
    - n. Notation of coordination requirements.
  - 4. Submit Product Data before or concurrent with Samples.
  - 5. Number of Copies: Submit four hard copies and electronic file of Product Data, unless otherwise indicated. No copies will be returned. Mark up and retain one copy as a Project Record Document.
- D. Shop Drawings: Prepare Project specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - l. Notation of dimensions established by field measurement.

- m. Relationship to adjoining construction clearly indicated.
    - n. Seal and signature of professional engineer if specified.
    - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  2. Sheet Size: Same size as contract drawings, 30 inch x 42 inch maximum.
  3. Number of Copies: Submit one reproducible transparency and one blue or black line print. One copy will returned.
- E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
  1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of appropriate Specification Section.
  3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  4. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Architect Engineer will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- F. Product Schedule or List: As required in individual Specification Sections, prepare and maintain a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product.
  2. Number and name of room or space.
  3. Location within room or space.
  4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect Engineer will return two copies.
    - a. Mark up and retain one returned copy as a Project Record Document.
- G. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

- H. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use form acceptable to Architect Engineer. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
  - 4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Two copies will be returned.
    - a. Mark up and retain one returned copy as a Project Record Document.

## 2.02 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
  - 1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated in the individual specification section. Copies will not be returned.
  - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  - 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on

evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."
- N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
  - 1. Preparation of substrates.
  - 2. Required substrate tolerances.
  - 3. Sequence of installation or erection.
  - 4. Required installation tolerances.
  - 5. Required adjustments.
  - 6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
  - 1. Name, address, and telephone number of factory-authorized service representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Statement that products at Project site comply with requirements.
  - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- V. Progress Photographs
1. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect Engineer.
  2. In addition to periodic, recurring views, take photographs of each of the following events:
    - a. Completion of site clearing.
    - b. Excavations in progress.
    - c. Foundations in progress and upon completion.
    - d. Structural framing in progress and upon completion.
    - e. Enclosure of building, upon completion.
    - f. Final completion, minimum of ten (10) photos.
  3. Views:
    - a. Provide aerial photographs from four cardinal views at each specified time, until structure is enclosed.
    - b. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
    - c. Consult with Architect Engineer for instructions on views required.
    - d. Provide factual presentation.
    - e. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
  4. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
    - a. Delivery Medium: Electronic delivery by Newforma Information Exchange or email.
    - b. File Naming: Include project identification, date and time of view, and view identification.
    - c. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
    - d. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.
- W. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect Engineer.
1. Architect Engineer will not review submittals that include MSDSs and may return them for resubmittal.

### **2.03 DELEGATED DESIGN**

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect Engineer.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional registered in the State of Arkansas, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### **PART 3 EXECUTION**

#### **3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE**

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
  - 1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record.
  - 2. Contractor and Architect Engineer are required to use this service.
  - 3. It is Contractor's responsibility to submit documents in PDF format.
  - 4. Subcontractors, suppliers, and Architect Engineer's consultants will be permitted to use the service at no extra charge.
  - 5. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, [www.adobe.com](http://www.adobe.com), or Bluebeam PDF Revu, [www.bluebeam.com](http://www.bluebeam.com)), unless such software capability is provided by the service provider.
  - 6. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
  - 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Submittal Service: The selected service is:
  - 1. Architect Engineer's Newforma Info Exchange: Provided by Architect Engineer at no cost to Owner or Contractor. Valid email is required for access. Contact [Printshop@cromwell.com](mailto:Printshop@cromwell.com).
- C. Training: One, one-hour, training session will be arranged for all participants, with representatives of Architect Engineer and Contractor participating; further training is the responsibility of the user of the service.
- D. Project Closeout: Architect Engineer will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

#### **3.02 CONTRACTOR'S REVIEW**

- A. Review each submittal and check for coordination with other Work of the Project and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect Engineer.
- B. Coordinate submittals with the Project Construction Schedule.
- C. Do not indicate "By Others," or words to that effect. Coordinate with Design-Builder to indicate the Work of the appropriate Contractor(s).
- D. Approval Stamp: Stamp each submittal with the approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- E. Log each submittal and review for coordination with other Work of the Project and the Project Schedule. Mark with submittal received date stamp before transmitting to Architect Engineer.
- F. Coordinate submittals with the Project Construction Schedule. When submittals indicate "By Others," or words to that effect, annotate the submittal to indicate the Work of the appropriate trade(s).
- G. Deliver submittals promptly to Architect Engineer.
- H. Received submittals returned from Architect Engineer.

- I. Revise and maintain the Project Construction Schedule as required when resubmittals are required.

**3.03 ARCHITECT ENGINEER'S ACTION**

- A. General: Architect Engineer will not review submittals that are not coordinated or that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
  1. "No Exceptions Taken".
  2. "Make Corrections Noted".
  3. "Revise and Resubmit".
  4. "Not accepted, see Comments".
- C. Informational Submittals: Architect Engineer will review each submittal and will not return it, or may return it if it does not comply with requirements.
  1. Architect Engineer will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and may be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 01 45 33**  
**SPECIAL INSPECTIONS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, may apply to this Section.
- B. Section 01 40 00 - Quality Requirements. Requirements for Contractor performed independent tests and inspections that are normally Contractor's responsibility and are not specifically indicated within the requirements of this section.

**1.02 SUMMARY**

- A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Special Inspections and Tests.
- B. Special inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Construction Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the construction document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this section.
- C. The Owner will engage one or more qualified special inspectors and / or testing agencies to conduct special inspections and tests specified in this section and related sections and as maybe specified in other divisions of these specifications.
- D. Refer to Statement of Special Inspections and forms following the end of this section for the inspection and testing requirements and forms to be utilized by the contractor and inspectors as described in paragraph 3.04.
- E. Related Sections include but are not limited to the following:
  - 1. 033000 (03300) - Cast-in-Place Concrete
  - 2. 042000 (04810) - Unit Masonry
  - 3. 312323 (02316) - Fill
  - 4. 316329 (02468) - Drilled Concrete Piers and Shafts

**1.03 RELATED STANDARDS**

- A. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2013
- B. ICC (IBC) - International Building Code; 2012.
- C. SEAoAR SI GL 02 - 01/01/2014; Arkansas Special Inspections Guidelines; [www.SEAoAR.org](http://www.SEAoAR.org).
- D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010

**1.04 DEFINITIONS**

- A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.
- B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental

instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

- C. Designated Seismic System: Those architectural, electrical and mechanical systems and their components that require design in accordance with Chapter 13 of ASCE 7 and for which the component importance factor,  $I_p$ , is greater than 1 in accordance with Section 13.1.3 of ASCE 7.
- D. Registered Design Professional in Responsible Charge: The individual that prepares the Statement of Special Inspections including a Schedule of Special Inspection Services as part of the general requirements Section 1704 of the Building Code. The Registered Design Professional for special inspections is typically the project architect. The architect will take input from the structural, mechanical and electrical engineers and act as the overall Registered Design Professional in Responsible Charge of preparing the Statement of Special Inspections.
- E. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.
- F. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.
- G. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
- H. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- I. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

#### **1.05 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:
  - 1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E 329 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
    - a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the Building Official for consideration before proceeding with work.
  - 2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

#### **1.06 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS**

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as

appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.

- C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the Contractor.
- D. Where a conflict exists between the Construction Documents and approved shop drawings / submittal data, the Construction Documents shall govern, unless the approved shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the Registered Design Professional in Responsible Charge.

## **PART 2 PRODUCTS (NOT USED)**

## **PART 3 EXECUTION**

### **3.01 SPECIAL INSPECTOR (TESTING AGENCIES) RESPONSIBILITIES**

- A. The Special Inspectors shall:
  - 1. Notify the Contractor of their presence and responsibilities at the job site.
  - 2. Observe assigned work for which they are responsible for conformance with the plans and specifications and approved submittals for work designed by the Contractor.
  - 3. Report nonconforming items to the immediate attention of the Contractor for correction.
  - 4. Write a discrepancy report about each nonconforming item containing:
    - a. Description and exact location.
    - b. Reference to applicable drawings and specifications.
    - c. Resolution or corrective action taken and the date.
  - 5. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and to the Registered Design Professional In Responsible Charge prior to the completion of that phase of the work.
  - 6. Provide special inspection reports directly to the Design Professional, the Contractor and the Building Official at the intervals indicated on the Statement of Special Inspections. The reports should:
    - a. Describe the special inspection and tests made, with locations.
    - b. Indicate nonconforming items and their resolution.
    - c. List unresolved items and parties notified.
    - d. Itemize any changes authorized by the Design Professional.
  - 7. Initial and date the "Date Completed" box in the Schedule of Special Inspection Services as the inspection and testing activities are completed.
  - 8. Submit a final signed report stating that all required special inspections and testing were fulfilled and reported and that any outstanding discrepancies have been corrected.
  - 9. Submit a completed copy of the City of Little Rock - Engineer Certification of Structural Retaining Wall Construction to the Registered Design Professional In Responsible Charge and the Contractor.

### **3.02 CONTRACTOR'S RESPONSIBILITY**

- A. The Contractor shall be familiar with Chapter 17 of the International Building Code.
- B. The Contractor shall coordinate the inspection and testing services with the progress of the work. The Contractor shall provide sufficient notice to allow proper scheduling of all personnel. The Contractor shall provide safe access for performing inspection and on site testing.
- C. The Contractor shall provide and maintain project schedules to the Owner, Registered Design Professionals and testing and inspecting agencies. Project schedules shall indicate milestones and durations of time for materials requiring structural tests and special inspections, including retesting or reinspections required.
- D. Notify special inspectors 72 hours prior to expected time for operations requiring testing/inspection services.
- E. Provide Special Inspectors direct access to the approved plans and specifications for the project, including modifications.
- F. Deliver samples for testing when needed.

- G. Cooperate with special inspectors, and provide access to the Work .
- H. Provide incidental labor and facilities:
  - 1. To provide access to Work to be tested/inspected.
  - 2. To obtain and handle samples at the site or at source of Products to be tested/inspected.
  - 3. To facilitate tests/inspections.
  - 4. To provide storage and curing of test samples.
- I. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified special inspection requirements.
- J. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified special inspection requirements.
- K. Maintain the Schedule of Special Inspection Services at the project site and submit a copy to the Design Professional and the Building Official when all the services are complete.
- L. The Contractor shall submit certification as an Approved Fabricator prior to any shop fabrication of load-bearing members and assemblies, where the fabricator requests to perform such work without special inspection.
- M. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections Requirements for Seismic Resistance shall submit a written Contractor's Statement of Responsibility to the Building Official and to the Owner prior to the commencement of work on the system or component. The Contractor's Statement of Responsibility shall contain the following:
  - 1. Acknowledgement of the awareness of the special requirements contained in the Statement of Special Inspections.
  - 2. Acknowledgement that control shall be exercised to obtain conformance with the construction documents approved by the Building Official.
  - 3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of the reports.
  - 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- N. Each contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the Statement of Special Inspections Requirements for Tornado Resistance shall submit a written statement of responsibility to the Building Official and the Owner prior to the commencement of work on the system or component. The Contractor's Statement of Responsibility shall contain the following:
  - 1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
  - 2. Acknowledgement that control shall be exercised to obtain conformance with the Construction Documents approved by the Building Official.
  - 3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
  - 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- O. The Contractor shall repair and / or replace work that does not meet the requirements of the Construction Documents.
  - 1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
  - 2. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the Registered Design Professional in Responsible Charge, Building Official, and Owner.
  - 3. Procedures shall be submitted for review and acceptance by the Registered Design Professional in Responsible Charge, Building Official, and Owner before proceeding with corrective action.
- P. The Contractor shall be responsible for costs of:

1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the Construction Documents and shop drawings / submittal data.
  2. Review of proposed repair and / or replacement procedures by the Registered Design Professional in Responsible Charge and the inspectors and testing agencies.
  3. Repair or replacement of work that does not meet the requirements of the Construction Documents.
- Q. The Contractor shall submit Fabricator's Certificates of Compliance for approved fabricators to the Registered Design Professional in Responsible Charge and Building Official after completion of fabrication.
- R. The Contractor shall submit Manufacturer's Certificates of Compliance, specific to the project location, for all mechanical and electrical equipment indicated to be seismically qualified.
- S. The Contractor shall maintain one copy of all required manufacturer's equipment Certificates of Compliance, for special inspector's use, at the jobsite.
- T. The Contractor shall maintain one copy of all shop drawings indicating seismic restraint design for all designated seismic systems, for special inspector's use, at the jobsite.
- U. The Contractor shall submit the completed City of Little Rock - Engineer Certification of Structural Retaining Wall Construction form to Public Works, Civil Engineering prior to issuance of the certificate of occupancy

### **3.03 INSPECTION AND TESTING**

- A. Inspection and Testing shall be in accordance with the attached Schedule of Special Inspection Services.
- B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings and as required by reference standards indicated in IBC Chapter 17.

### **3.04 SCHEDULES AND FORMS (INCLUDED FOLLOWING THE END OF THIS SECTION)**

- A. STATEMENT OF SPECIAL INSPECTIONS.
1. The Statement of Special Inspections is included as an attachment to this section. This form provides the general project information. It identifies the project location, the architect of record, the structural, mechanical, and electrical engineers, the Registered Design Professional in Responsible Charge, and Special Inspection Requirements for Seismic or Wind Resistance.
  2. The [] shall submit the Statement of Special Inspections with the application for the building permit and have the Building Official sign, date, and shall add the building permit number to the statement. The Contractor shall send a copy of the completed document to the Architect Engineer, Owner, Building Official, and keep a copy in the job site office.
- B. SCHEDULE OF SPECIAL INSPECTION SERVICES.
1. The Schedule of Special Inspection Services is included as an attachment to this section. This form provides a detailed and itemized list of which special inspection activities are required for the specific project and which individuals, firm, or agency will be performing the special inspection services associated with each required task.
  2. The Contractor shall maintain the schedule at the project site. When an individual special inspection task in the schedule is completed for the last time on the project and the special inspector performed their final review, inspection, or test of that item for the project, the special inspector shall initial and date the cell in the "Completed" column adjacent to the task. The schedule shall be maintained by the Contractor at the project site.
  3. At the conclusion of the project a copy of the Schedule of Special Inspection Services form with the initials and date in the "Completed" column for each task relevant to the project shall be submitted, by the Contractor, to the Design Professional in Responsible Charge and the Building Official for comparison with the Final Reports of Special Inspections.
- C. FINAL REPORT OF SPECIAL INSPECTIONS.
1. The form for the final report of Special Inspections is included as an attachment to this section. This form is submitted by each inspector when all the special inspection

requirements they are responsible for on the project have been fulfilled and all noted deficiencies have been corrected. Each special inspector corresponding to an agent number in the Schedule of Special Inspection Services will be required to complete a copy of this form.

2. The special inspectors shall provide 3 bound copies of the special inspection interim reports with the final report of special inspections serving as the cover sheet. The copies shall be submitted to the Design Professional in Responsible Charge and Building Official within 2 weeks of completion of the special inspection program. The special inspection program will not be considered complete until forms from all agents have been submitted and received.
- D. CONTRACTOR'S STATEMENT OF RESPONSIBILITY.
1. The form for the Contractor's Statement of Responsibility is included as an attachment to this section.
  2. Each contractor responsible for the construction or fabrication of a seismic force resisting system, designated seismic system or component, listed in the Statement of Special Inspections - Requirements for Seismic Resistance, shall submit a written statement of responsibility to the Building Official and Design Professional in Responsible Charge prior to the commencement of work on the system or component.
  3. Each contractor responsible for the construction or fabrication of a main wind force resisting system or a wind force resisting component listed in the Statement of Special Inspections - Requirements for Tornado Resistance, shall submit a written statement of responsibility to the Building Official and Design Professional in Responsible Charge prior to the commencement of work on the system or component.
  4. Contractor's Statements of Responsibility shall be submitted to the Design Professional in Responsible Charge for approval along with the design submittal for the associated work.
- E. FABRICATOR'S CERTIFICATE OF COMPLIANCE.
1. The form for the approved Fabricator's Certificate of Compliance is included as an attachment to this section.
  2. Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5.2 of the Building Code must submit Fabricator's Certificate of Compliance at the completion of fabrication to the Contractor.
  3. The Contractor shall submit Fabricator's Certificates of Compliance for approved fabricators to the Design Professional in Responsible Charge and the Building Official.
- F. MINIMUM SPECIAL INSPECTOR QUALIFICATIONS.
1. This document is included as an attachment to this section.
  2. This document lists the Structural Engineers Association of Arkansas (SEAoAR)'s recommended minimum qualifications for special inspectors.
  3. The final approval of an inspector shall be determined by the building official.
- G. OTHER SPECIAL INSPECTION REPORT AND NOTICE FORMS.
1. Forms for Special Inspection Reports and Discrepancy Notices are included as attachments to this section.
- H. CITY OF LITTLE ROCK - ENGINEER CERTIFICATION OF STRUCTURAL RETAINING WALL CONSTRUCTION
1. The form for the Engineer Certification of Structural Retaining Wall Construction is included as an attachment to this section.
  2. This form is completed by a professional engineer licensed in the State of Arkansas who has observed the construction of the project retaining walls.
  3. The certifying engineer shall provide the completed form to the Design Professional in Responsible Charge and the Contractor.
  4. The Contractor shall submit the certification form to the City of Little Rock, Public Work, Civil Engineering prior to issuance of a certificate of occupancy.

5. The Contractor shall also coordinate with the City of Little Rock Public Works staff for separate City inspection of all retaining walls.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



# STATEMENT OF SPECIAL INSPECTIONS

(Completed by the Registered Design Professional in Responsible Charge)

**PROJECT:** City of Little Rock Animal - Crematorium

**LOCATION:** 4500 Kramer Street Little Rock, AR 72204

**PERMIT APPLICANT:** City of Little Rock

**APPLICANT'S ADDRESS:** 4500 Kramer Street Little Rock, AR 72204

**ARCHITECT OF RECORD:** Mark Litrell A.I.A.

**STRUCTURAL ENGINEER OF RECORD:** Oscar Barrios P.E.

**MECHANICAL ENGINEER OF RECORD:** Robert Seay P.E.

**ELECTRICAL ENGINEER OF RECORD:** Pamela Mcelrath P.E.

**REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE:** Mark Litrell A.I.A.

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2012 Arkansas Fire Prevention Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Tornado Resistance*.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*?

Yes  No

Are *Requirements for Tornado Resistance* included in the *Statement of Special Inspections*?

Yes  No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

Weekly  Bi-Weekly  Monthly Other; specify: \_\_\_\_\_

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

\_\_\_\_\_  
Type or print name

\_\_\_\_\_  
Signature Date

Building Official's Acceptance:

\_\_\_\_\_  
Signature Date

Permit Number:

Frequency of interim report submittals to the Building Official:

Monthly  Bi- Monthly  Upon Completion Other; specify: \_\_\_\_\_

**This page was intentionally left blank for duplex printing.**

## Statement of Special Inspections Requirements for Seismic Resistance

---

See the Schedule of Special Inspections for inspection and testing requirements.

**Seismic Design Category: C**

**Statement of Special Inspection for Seismic Resistance Required (Yes/No): YES**

**Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:**

(Required for Seismic Design Categories C, D, E or F in accordance with Building Code Section 1705.11.1 through 1705.11.3, 1705.12.1 and 1705.12.2.)

1. Structural steel special inspections for seismic resistance.(1705.11.1)
2. Structural wood special inspections for seismic resistance.(1705.11.2)

**Description of designated seismic systems subject to special inspection, testing and qualification for seismic resistance:**

(Required for architectural, electrical and mechanical systems and their components that require design in accordance with ASCE 7-10 Chapter 13, have a component importance factor,  $I_p$ , greater than one and are in Seismic Design Categories C, D, E or F, in accordance with Building Code Section 1705.11.4 and 1705.12.3.)

N/A

**Description of additional components and systems requiring special inspections, testing and qualification for seismic resistance:**

(Required for systems noted in Building Code Section 1705.11, cases 3, 4 & 5 or Section 1705.12, cases 3 & 4, in Seismic Design Category C,D,E or F)

N/A

**Statement of Responsibility:**

Each contractor responsible for the construction or fabrication of a system or component described above must each submit a Statement of Responsibility (pg C1) in accordance with Building Code Section 1704.4.

**This page was intentionally left blank for duplex printing.**

## Statement of Special Inspections Requirements for Tornado Resistance

---

See the Schedule of Special Inspections for inspection and testing requirements

**Design Wind Speed: 115 m.p.h.**

(The tornado design wind speed is 250 miles per hour for the entire state of Arkansas per FEMA P-361.)

**Wind Exposure Category: C**

(Wind Exposure Category C should be used to calculate wind pressures acting on community safe rooms and tornado shelters designed and constructed in accordance with FEMA P-361.)

**Statement of Special Inspection for Tornado Resistance Required (Yes/No): No**

(Required for community safe rooms and tornado shelters designed and constructed in accordance with FEMA P-361.)

**Description of main wind force-resisting system subject to special inspection for wind resistance:**

(Required for systems noted in Building Code Section 1705.10.1 and 1705.10.2)

**Description of wind force-resisting components subject to special inspection for wind resistance:**

(Required for systems noted in Building Code Section 1705.10.3)

**Statement of Responsibility:**

Each contractor responsible for the construction or fabrication of a system or component described above must each submit a Statement of Responsibility (pg C1) in accordance with Building Code Section 1704.4.

**This page was intentionally left blank for duplex printing.**

## SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
<b>1705.2 Structural Steel Construction</b>					
1. Review the material test reports and certificates as listed in AISC 360-10, Section N3.2 for compliance with the construction documents	Submittal review		Each submittal		
2. Material verification of structural steel	Shop (3) and field inspection		Periodic		
3. Anchor Rods and other Embedment(s) (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection		Continuous		
4. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection		Periodic		
5. Structural steel welding:					
a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-1)	Shop (3) and field inspection		Observe or Perform as noted (4)		
b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-2)	Shop (3) and field inspection		Observe (4)		
c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-3)	Shop (3) and field inspection		Observe or Perform as noted (4)		
d. Nondestructive testing (NDT) of welded joints: <i>see Commentary</i>					
1) Complete penetration groove welds at joints in materials 5/16" thick or greater in Risk Category III or IV	Shop (3) or field ultrasonic testing - 100%		Periodic		
2) Complete penetration groove welds at joints in materials 5/16" or greater in Risk Category II	Shop (3) or field ultrasonic testing - 10% of welds minimum		Periodic		
3) Thermally cut surfaces of access holes when material t > 2"	Shop (3) or field magnetic Particle or Penetrant testing		Periodic		
4) Welded joints subject to fatigue when required by AISC 360, Appendix 3, Table A-3.1	Shop (3) or field radiographic or Ultrasonic testing		Periodic		
5) Fabricator's NDT reports when fabricator performs NDT	Verify reports		Each submittal (5)		
<b>1705.2.2 Steel Construction Other Than Structural Steel</b>					
1. Material verification of cold-formed steel deck:					
a. Identification markings	Field inspection		Periodic		

## SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
MATERIAL / ACTIVITY	SERVICE	APPLICABLE TO THIS PROJECT			
		Y/N	EXTENT	AGENT*	DATE COMPLETED
b. Manufacturer's certified test reports	Submittal Review		Each submittal		
2. Connection of cold-formed steel deck to supporting structure:	Shop (3) and field inspection				
a. Welding			Periodic		
b. Other fasteners (in accordance with AISC 360, Section N6)					
1) Verify fasteners are in conformance with approved submittal			Periodic		
2) Verify fastener installation is in conformance with approved submittal and manufacturer's recommendations			Periodic		
3. Welding reinforcing steel	Shop (3) and field inspection				
a. Verification of weldability of steel other than ASTM A706			Periodic		
b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, boundary elements of special concrete structural walls and shear reinforcement			Continuous		
c. Shear reinforcement			Continuous		
d. Other reinforcing steel			Periodic		
<b>1705.3 Concrete Construction</b>					
1. Inspection of reinforcing steel placement	Field inspection		Periodic		
2. Inspection of anchors cast in concrete where allowable loads have been increased or where strength design is used	Shop (3) and field inspection		Continuous		
3. Inspection of anchors and reinforcing steel post-installed in hardened concrete: Per research reports requirements	Field inspection		Periodic or as required by the research report issued by an approved source		
4. Verify use of approved design mix	Shop (3) and field inspection		Periodic		
5. Fresh concrete sampling, perform slump and air content tests and determine temperature of concrete	Shop (3) and field inspection		Continuous		
6. Inspection of concrete and shotcrete placement for proper application techniques	Shop (3) and field inspection		Continuous		
7. Inspection for maintenance of specified curing temperature and techniques	Shop (3) and field inspection		Periodic		
11. Inspection of formwork for shape, lines, location and dimensions	Field inspection		Periodic		
12. Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports		Periodic		
<b>1705.5 Wood Construction</b>					
1. Inspection of the fabrication process of wood structural elements and assemblies in accordance with Section 1704.2.5	In-plant review (3)		Periodic		



<b>SCHEDULE OF SPECIAL INSPECTION SERVICES</b>					
<b>PROJECT</b>	(Completed by the Registered Design Professional in Responsible Charge)				
<b>MATERIAL / ACTIVITY</b>	<b>SERVICE</b>	<b>APPLICABLE TO THIS PROJECT</b>			
		<b>Y/N</b>	<b>EXTENT</b>	<b>AGENT*</b>	<b>DATE COMPLETED</b>
2. For high-load diaphragms, verification of grade and thickness of structural panel sheathing.	Field inspection		Periodic		
<b>1705.6 Soils</b>					
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection		Periodic		
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection		Periodic		
3. Perform classification and testing of controlled fill materials.	Field inspection		Periodic		
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of compacted fill	Field inspection		Continuous		
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly	Field inspection		Periodic		
<b>1705.11.1 Structural Steel Special Inspections for Seismic Resistance</b>					
1. Fabricator and erector documents (Verify reports and certificates as listed in AISC 341-10, Section J2 for compliance with construction documents)	Submittal Review		Each submittal		
2. Structural steel welding:					
a. Inspection tasks Prior to, During and After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 341-10, Table J6-1, J6-2 & J6-3)	Shop (3) and field inspection		Observe or Perform as noted (4)		
b. Nondestructive testing (NDT) of welded joints in accordance with AISC 341-10, Section J6.2.	Shop (3) and field testing		Periodic		
<b>1705.11.2 Structural Wood Special Inspections for Seismic Resistance</b>					
1. Inspection of nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system	Shop (3) and field inspection		Periodic		
<b>1705.11.6 Mechanical and Electrical Components Special Inspections for Seismic Resistance</b>					
1. Inspection during the anchorage of electrical equipment for emergency or standby power systems.	Field inspection		Periodic		
<b>* INSPECTION AGENTS</b>	<b>FIRM</b>	<b>ADDRESS</b>	<b>TELEPHONE NO.</b>		
1.					
2.					
3.					
4.					
5.					
<i>Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies are subject to the approval of the Building Official and/or the Design Professional.</i> 2. The list of Special Inspectors may be submitted as a separate document, if noted so above.					

## SCHEDULE OF SPECIAL INSPECTION SERVICES

<b>PROJECT</b>	(Completed by the Registered Design Professional in Responsible Charge)				
<b>MATERIAL / ACTIVITY</b>	<b>SERVICE</b>	<b>APPLICABLE TO THIS PROJECT</b>			
		<b>Y/N</b>	<b>EXTENT</b>	<b>AGENT*</b>	<b>DATE COMPLETED</b>
<p>3. <i>Special Inspections as required by Section 1704.2.5 are not required where the fabricator is approved in accordance with IBC Section 1704.2.5.2</i></p> <p>4. <i>Observe on a random basis, operations need not be delayed pending these inspections. Perform these tasks for each welded joint, bolted connection, or steel element.</i></p> <p>5. <i>NDT of welds completed in an approved fabricator's shop may be performed by that fabricator when approved by the AHJ. Refer to AISC 360, N7.</i></p> <p><b>Circle "Yes" or "No" as appropriate and date this document below:</b></p> <p>Are Requirements for Seismic Resistance included in the Statement of Special Inspections? <span style="float: right;">Yes No</span></p> <p>Are Requirements for Tornado Resistance included in the Statement of Special Inspections? <span style="float: right;">Yes No</span></p> <p style="text-align: right;">DATE:</p>					

# FINAL REPORT OF SPECIAL INSPECTIONS

(Completed by each Special Inspector)

PROJECT: \_\_\_\_\_

LOCATION: \_\_\_\_\_

PERMIT APPLICANT: \_\_\_\_\_

APPLICANT'S ADDRESS: \_\_\_\_\_

\_\_\_\_\_

ARCHITECT OF RECORD: \_\_\_\_\_

STRUCTURAL ENGINEER OF RECORD: \_\_\_\_\_

MECHANICAL ENGINEER OF RECORD: \_\_\_\_\_

ELECTRICAL ENGINEER OF RECORD: \_\_\_\_\_

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: \_\_\_\_\_

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above-referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents and approved design revisions.

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Interim reports submitted prior to this final report and numbered \_\_\_ to \_\_\_ form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated \_\_\_\_\_ have been corrected:

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

*(Attach 8 1/2"x11" continuation sheet(s) if required to complete the description of corrections)*

## Prepared By:

\_\_\_\_\_  
Special Inspection Agent/Firm

\_\_\_\_\_  
Type or print name of Special Inspector

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**This page was intentionally left blank for duplex printing.**

## Contractor's Statement of Responsibility

---

Each contractor responsible for the construction or fabrication of a main wind- or seismic force-resisting system, designated seismic system or a wind- or seismic-resisting component listed in the Statement of Special Inspections (Requirements for Seismic or Tornado Resistance) must submit a Statement of Responsibility, in accordance with the Building Code, Section 1704.4.

Project: \_\_\_\_\_

Contractor's Name: \_\_\_\_\_

Address: \_\_\_\_\_

License No.: \_\_\_\_\_

Description of building systems and components included in Statement of Responsibility:

---

---

---

---

---

---

---

---

### Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to achieve conformance with the approved construction documents.

\_\_\_\_\_  
Name and Title (type or print)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

### Contractor's Provisions for Quality Control

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement

**This page was intentionally left blank for duplex printing.**



**This page was intentionally left blank for duplex printing.**



## MINIMUM SPECIAL INSPECTOR QUALIFICATIONS

Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop Inspection	Field Testing /Inspection	Review Submittals	Review Testing, Certification, & Lab Reports
<b>1704.2.5 Inspection of Fabricators</b>				
Pre-cast concrete	A, C, E			
Structural steel construction	C, F, G			
Wood construction	A, N			
Cold formed metal construction	A, N			
<b>1705.2 &amp; 1705.11.1 Steel Construction</b>				
Welding	C, F, G	C, F, G	A	A
High strength bolting, inspection of steel frame joint details		A, C	A	A
<b>1705.2.2, 1705.10.2 &amp; 1705.11.3 Steel Construction other than Structural Steel</b>				
Welding	C, F, G	C, F, G	A	A
Screw attachment, bolting, anchoring and other fastening		A, C	A	A
<b>1705.3 &amp; 1705.12.1 Concrete Construction</b>				
Reinforcing placement, cast-in-place bolts, post installed anchors, concrete and shotcrete placement and curing operations		A, C, H		
Pre-stressing steel installation		A, C, D, E		
Erection of pre-cast concrete members		A, C, H, Q		
Concrete field testing		A, C, H, I, J		
Review certified mill reports and design mixes			A	
Verify use of required design mix		A, C, H, I, J		
Pre-stressed (pre-tensioned) concrete force application	A, C, E			
Post-tensioned concrete force application		A, C, D, H		
Review of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs		A, C, D		
Reinforcing steel weldability, reinforcing welding, weld filler material		C, F, G		
<b>1705.4 Masonry</b>				
Review $f'_m$ prior to construction			A	
Mortar joint construction, grout protection and placement, materials proportion, type/size/location of reinforcement, structural elements, anchorage, and connectors		A, C, K		
Sampling/testing of grout/mortar specimens		A, C, K		
Observe preparation of masonry prisms for testing of compressive strength of masonry, $f'_m$		A, C, K		
Inspection of welding of reinforcing steel		C, F, G		
<b>1705.6 Soils</b>				
Observe site preparation, fill placement and testing of compaction for compliance with the construction documents for the project		A, C, I, R		
Observe and test bearing materials below shallow foundations for ability to achieve design bearing capacity		A, L		
Review compaction testing for compliance with the construction documents for the project				A

(Table continued on next page)

**MINIMUM SPECIAL INSPECTOR QUALIFICATIONS** *(continued)*

Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop Inspection	Field Testing /Inspection	Review Submittals	Review Testing, Certification, & Lab Reports
<b>1705.5, 1705.10.1 &amp; 1705.11.2 Wood Construction</b>				
Observe structural panel sheathing, size of framing members, fastener diameter and length, number of fastener lines, and spacing of fastener lines and fasteners for compliance with construction documents for the project		A, N		
<b>1705.7, 1705.8 &amp; 1705.9 Driven Deep, Cast-in-place Deep, and Helical Pile Foundations</b>				
Observe installation		A, L, I		
Observe load tests		A, I		
<b>1705.10.3 Wind Resisting Components</b>				
Inspect roof cladding		A, B, C		
Inspect wall cladding		A, B, C		
<b>1705.11.4 Designated Seismic Systems</b>				
Examine designated seismic systems requiring seismic qualification and verify that the label, anchorage or mounting conform to the certificate of compliance		A	A	A
<b>1705.11.5 &amp; 1705.11.7 Architectural Components</b>				
Inspection of exterior cladding, non-load bearing walls, veneer, access floors and storage racks		A, B	A, B	A, B
<b>1705.11.6 &amp; 1705.12.3 Mechanical and Electrical Components</b>				
Inspection of anchorage of mechanical and electrical components		A	A	A
<b>1705.13 Sprayed Fire-Resistant Materials</b>				
Observe surface conditions, application, average thickness and density of applied material, and cohesive/adhesive bond		A, C		
<b>1705.14 Mastic and intumescent fire-resistant coatings</b>				
Observe application compliance with AWCI 12-B		A, C		
<b>1705.15 Exterior Insulation and Finish Systems</b>				
Inspect EIFS systems		A, B, C, M		
<b>1705.16 Fire-resistant penetrations and joints</b>				
Inspection of Penetration firestops		A, C, P		
Inspection of Fire-resistant joint systems		A, C, P		
<b>[F] 1705.17 Smoke Control</b>	<i>See Requirements of Building Code Section [F] 1705.17.2.</i>			
<i>(Table continued on next page)</i>				

## MINIMUM SPECIAL INSPECTOR QUALIFICATIONS *(continued)*

### KEY:

- A. Arkansas Professional Engineer (AR PE) competent in the specific task area or graduate of accredited engineering/engineering technology program under the direct supervision of an AR PE.
- B. Arkansas Registered Architect (AR RA) competent in the specific task area or graduate of accredited architecture/architecture technology program under the direction of an AR RA.
- C. International Code Council (ICC) Special Inspector Certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
- D. Post-tensioning Institute (PTI) Certification, Level 2.
- E. Pre-stressed Concrete Institute (PCI) Plant Quality Personnel Certification – Level III.
- F. American Welding Society (AWS) Certified Welding Inspector (CWI) or AWS Certified Associate Welding Inspector working under the direct on-site supervision of a CWI.
- G. American Society for Nondestructive Testing (ASNT) Level II certification, or a Level III certification if previously certified as a Level II in the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
- H. American Concrete Institute (ACI) Concrete Construction Special Inspector.
- I. National Institute for Certification in Engineering Technologies (NICET) Level II or higher certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
- J. ACI Concrete Field Testing Technician with Grade 1 certification or Center for Training Transportation Professionals (CTTP) Certified Concrete Field Testing Technician.
- K. National Concrete Masonry Association (NCMA) Certified Concrete Masonry Testing Technician.
- L. NICET Certified Engineering Technologist (CT) competent in the specific task area.
- M. Association of the Wall and Ceiling Industry (AWCI) EIFS Inspector Certification.
- N. International Code Council (ICC) Commercial Building Inspector Certification.
- O. International Code Council (ICC) Mechanical Inspector Certification.
- P. Inspector has passed either the Underwriters Laboratory (UL) Firestop Contractor Program Examination or the Factory Mutual (FM) Firestop Examination.
- Q. Pre-stressed Concrete Institute (PCI) Certified Field Auditor
- R. Center for Training Transportation Professionals (CTTP) Certified Soil Testing Technician.

### Notes:

1. *The Special Inspector shall meet one of the minimum qualifications listed for the applicable Category of Testing and Inspection.*
2. *Materials testing shall be done by an Approved Testing Agency meeting the requirements of the Building Code Section 1703 and ASTM E 329.*

**This page was intentionally left blank for duplex printing.**

# SPECIAL INSPECTION REPORT

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:	
DATE OF INSPECTION:	
INSPECTION TYPE(S) COVERAGE  <input type="checkbox"/> CONTINUOUS <input type="checkbox"/> PERIODIC TIME BEGINNING INSPECTION:                      TIME ENDING INSPECTION:	
DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:	
LIST TESTS MADE:	
LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:	
COMMENTS:	
TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.	
PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY	
SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

**This page was intentionally left blank for duplex printing.**

**SPECIAL INSPECTION DISCREPANCY NOTICE**

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:		
INSPECTION TYPE(S) COVERAGE		
<input type="checkbox"/> CONTINUOUS <input type="checkbox"/> PERIODIC		
AREA INSPECTED	TYPE OF INSPECTION	
APPLICABLE DRAWING SHEET NUMBER(S) AND/OR SPECIFICATION SECTION:		
NOTICE DELIVERED TO: <input type="radio"/> CONTRACTOR <input type="radio"/> ENGINEER/ARCHITECT <input type="radio"/> OWNER	DATE:	TIME:
MAKE THE FOLLOWING CORRECTIONS AND SECURE INSPECTION APPROVAL PRIOR TO PROCEEDING WITH THIS PHASE OF THE WORK.		
PRINTED FULL NAME		
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY		
SIGNED:	DATE:	
CERTIFICATION:	NUMBER:	
DATE RE-INSPECTED AND APPROVED AND SIGNATURE OF SPECIAL INSPECTOR:		

One copy of this report to remain at job site with the contractor for review upon request.

**This page was intentionally left blank for duplex printing.**



**SECTION 01 57 13**  
**TEMPORARY EROSION AND SEDIMENT CONTROL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.
- C. Section 32 92 23 - Sodding: Permanent turf for erosion control.

**1.03 REFERENCE STANDARDS**

- A. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2007.
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2009).
- C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2011.
- D. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2008.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.
- F. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002 (Reapproved 2009).
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
  - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

- F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
  - 1. Control movement of sediment and soil from temporary stockpiles of soil.
  - 2. Prevent development of ruts due to equipment and vehicular traffic.
  - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
  - 1. Prevent windblown soil from leaving the project site.
  - 2. Prevent tracking of mud onto public roads outside site.
  - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
  - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- H. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
  - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- I. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
  - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- J. Open Water: Prevent standing water that could become stagnant.
- K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Mulch: Use one of the following:
  - 1. Straw or hay.
  - 2. Wood waste, chips, or bark.
  - 3. Erosion control matting or netting.
  - 4. Cutback asphalt.
  - 5. Polyethylene film, where specifically indicated only.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Bales: Air dry, rectangular straw bales.
  - 1. Cross Section: 14 by 18 inches, minimum.
  - 2. Bindings: Wire or string, around long dimension.
- D. Bale Stakes: One of the following, minimum 3 feet long:
  - 1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

2. Wood, 2 by 2 inches in cross section.
- E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
  1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
  2. Permittivity:  $0.05 \text{ sec}^{-1}$ , minimum, when tested in accordance with ASTM D4491.
  3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355 after 500 hours exposure.
  4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632.
  5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632.
  6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D4533.
  7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- F. Silt Fence Posts: One of the following, minimum 5 feet long:
  1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
  2. Softwood, 4 by 4 inches in cross section.
  3. Hardwood, 2 by 2 inches in cross section.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

#### **3.02 PREPARATION**

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

#### **3.03 SCOPE OF PREVENTIVE MEASURES**

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
  1. Width: As required; 20 feet, minimum.
  2. Length: 50 feet, minimum.
  3. Provide at each construction entrance from public right-of-way.
  4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences.
  1. Provide linear sediment barriers:
    - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
    - b. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
  2. Space sediment barriers with the following maximum slope length upslope from barrier:
    - a. Slope of Less Than 2 Percent: 100 feet..
    - b. Slope Between 2 and 5 Percent: 75 feet.
    - c. Slope Between 5 and 10 Percent: 50 feet.
    - d. Slope Between 10 and 20 Percent: 25 feet.
    - e. Slope Over 20 Percent: 15 feet.
- D. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- E. Soil Stockpiles: Protect using one of the following measures:
  1. Cover with polyethylene film, secured by placing soil on outer edges.

2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.
- F. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
  2. Asphalt: Use only where no traffic, either vehicular or pedestrian, is anticipated.
- G. Temporary Seeding: Use where temporary vegetated cover is required.

### 3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
1. Excavate minimum of 6 inches.
  2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
  3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.
- B. Silt Fences:
1. Store and handle fabric in accordance with ASTM D4873.
  2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
  3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
  4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
  5. Install with top of fabric at nominal height and embedment as specified.
  6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
  7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
  8. Fasten fabric to wood posts using one of the following:
    - a. Four 3/4 inch diameter, 1 inch long, 14 gage nails.
    - b. Five 17-gage staples with 3/4 inch wide crown and 1/2 inch legs.
  9. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
  10. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
- C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
  2. Install bales so that bindings are not in contact with the ground.
  3. Embed bales at least 4 inches in the ground.
  4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
  5. Fill gaps between ends of bales with loose straw wedged tightly.
  6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
  2. Wood Waste: Apply 2 to 3 inches depth.
  3. Asphalt: Apply 1/4 gallon per square yard.
  4. Erosion Control Matting: Comply with manufacturer's instructions.
- E. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.

2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

### **3.05 MAINTENANCE**

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
  1. Promptly replace fabric that deteriorates unless need for fence has passed.
  2. Remove silt deposits that exceed one-third of the height of the fence.
  3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
  1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
  2. Remove silt deposits that exceed one-half of the height of the bales.
  3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

### **3.06 CLEAN UP**

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect Engineer.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 01 60 00**  
**PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Transportation, handling, storage and protection.
- B. Product option requirements.
- C. Substitution limitations and procedures.
- D. Maintenance materials, including extra materials, spare parts, tools, and software.

**1.02 RELATED REQUIREMENTS**

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

**1.03 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; National Fire Protection Association.

**1.04 SUBMITTALS**

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit within 15 days after date of Agreement.
  - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

**PART 2 PRODUCTS**

**2.01 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Where all other criteria are met, Contractor shall give preference to products that:
  - 1. If used on interior, have lower emissions, as defined in Section 01 61 16.
  - 2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
  - 3. Have a published GreenScreen Chemical Hazard Analysis.
- C. Provide interchangeable components of the same manufacture for components being replaced.
- D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

**2.02 PRODUCT OPTIONS**

- A. Products Indicated by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Indicated by Naming One or More Manufacturers and "No Substitutes" indicated: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

- C. Products Indicated by Naming One or More Manufacturers with or without a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- D. Products indicated in the color and finish schedules or drawing notes; including color, shade, hue, translucence, opacity, pattern, or texture; establish the Basis of Design. Use the Basis of Design. Submit a request for substitution for any product not indicated.

### **2.03 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

## **PART 3 EXECUTION**

### **3.01 SUBSTITUTION PROCEDURES**

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Architect Engineer will consider requests for substitutions only within 30 days after date of Agreement.
- C. Products indicated in the color and finish schedules or drawing notes; including color, shade, hue, translucence, opacity, pattern, or texture; establish the Basis of Design. Use the Basis of Design. Submit a request for substitution for any product not named.
- D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- E. A request for substitution constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
  - 5. Will reimburse Owner and Architect Engineer for review or redesign services associated with re-approval by authorities.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- G. Substitution Submittal Procedure:
  - 1. Submit one electronic pdf file and one hard copy of the pdf of request for substitution for consideration. Limit each request to one proposed substitution.
  - 2. Use form 01 33 01 or other form acceptable to Architect Engineer.
  - 3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
  - 4. The Architect Engineer will notify Contractor in writing of decision to accept or reject request.

### **3.02 TRANSPORTATION AND HANDLING**

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.



- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

**3.03 STORAGE AND PROTECTION**

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 01 60 01**  
**SUBSTITUTION REQUEST FORM**

**TO: CROMWELL ARCHITECTS ENGINEERS (THROUGH A PRIME BIDDER OR TRADE CONTRACTOR)**

**ATTENTION: MARK LITTRELL, AIA <MLITTRELL@CROMWELL.COM>**

101 S Spring Street, Suite 100, Little Rock, AR 72201 (501) 372-2900

SECTION	PARAGRAPH	DESCRIPTION
_____	_____	SPECIFIED ITEM: _____
_____	_____	PROPOSED SUBSTITUTE: _____

Attach complete description, designation, catalog or model number, spec data sheet, and other technical data, including laboratory tests if applicable. In addition to data, include a side-by-side comparison of each element of the specified product and the proposed substitution. The Architect Engineer must be able to clearly and quickly compare all aspects of the two products. Insufficient information for review may be cause for rejection of proposed substitution. Burdon of proof is proposer's responsibility.

Approved substitution will only be issued by Addendum or other official Modification.

**FILL IN BLANKS BELOW:**

1. Will substitution affect dimensions indicated on drawings? \_\_\_\_\_
2. Will substitution affect wiring, piping, ductwork, etc., indicated on drawings? \_\_\_\_\_
3. Differences between proposed substitution and specified item? \_\_\_\_\_
4. What affect will substitution have on other trade contractors? \_\_\_\_\_
5. What affect will substitution have on Project Construction Schedule? \_\_\_\_\_
6. If necessary, will the undersigned pay for Architect Engineer's cost, required to revise working drawings, caused by substitution? \_\_\_\_\_
7. Manufacturer's warranties of specified items and proposed items are:  
 Same  Different (explain) \_\_\_\_\_

SUBMITTED BY:	REVIEW COMMENTS
Firm: _____	<input type="checkbox"/> Incomplete Information
Address: _____	<input type="checkbox"/> Approved
_____	<input type="checkbox"/> Approved As Noted
Signature: _____	(see attached copy)
Date: _____	<input type="checkbox"/> Not Approved
By: _____ Date: _____	<input type="checkbox"/> Received Too Late
Telephone: _____	Remarks: _____
Fax: _____	_____

**This page was intentionally left blank for duplex printing.**

**SECTION 01 70 00**  
**EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Closeout procedures, except payment procedures.
- I. General requirements for maintenance service.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate Contractor.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.

**1.04 PROJECT CONDITIONS**

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- D. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

**1.05 COORDINATION**

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

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

## **PART 2 PRODUCTS**

### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

## **PART 3 EXECUTION**

### **3.01 STRUCTURAL WORK**

- A. Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio. Submit proposal and request and obtain Architect Engineer's approval before proceeding with cut-and-patch of structural work.

### **3.02 VISUAL/QUALITY LIMITATIONS**

- A. Do not cut-and-patch work exposed to view, exterior and interior, in a manner resulting in noticeable reduction of visual qualities and similar qualities, as judged by Architect Engineer.
- B. Engage the original installer/fabricator or, if not available, an acceptable equivalent entity, to perform cutting and patching.
- C. Refinish entire surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish the entire unit.

### **3.03 LIMITATION ON APPROVALS**

- A. Architect Engineer's approval to proceed with cutting and patching does not waive right to later require removal/replacement of work found to be cut-and-patched in an unsatisfactory manner, as judged by Architect Engineer.

### **3.04 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### **3.05 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.

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

### **3.06 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect Engineer four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect Engineer, Owner, participants, and those affected by decisions made.

### **3.07 GENERAL INSTALLATION REQUIREMENTS**

- A. Accomplish the Work, including products, equipment, and systems; complete and functional; ready for operation.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

### **3.08 ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as shown.
  - 2. Report discrepancies to Architect Engineer before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
- C. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove items indicated on drawings.
  - 2. Relocate items indicated on drawings.
  - 3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  - 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services (Including but not limited to HVAC and Electrical): Remove, relocate, and extend existing systems to accommodate new construction.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

- a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
  - b. Provide temporary connections as required to maintain existing systems in service.
  4. Verify that abandoned services serve only abandoned facilities.
  5. Remove abandoned pipe, ducts, conduits, and equipment ; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
  2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect Engineer.
  2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
  3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect Engineer review and request instructions.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
  2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- I. Clean existing systems and equipment.
- J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- K. Do not begin new construction in alterations areas before demolition is complete.
- L. Comply with all other applicable requirements of this section.

### **3.09 CUTTING AND PATCHING**

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
  2. Fit products together to integrate with other work.
  3. Provide openings for penetration of mechanical, electrical, and other services.
  4. Match work that has been cut to adjacent work.
  5. Repair areas adjacent to cuts to required condition.
  6. Repair new work damaged by subsequent work.
  7. Remove samples of installed work for testing when requested.
  8. Remove and replace defective and non-conforming work.
- D. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. At in place work (new or existing), minimize damage and restore to original or specified condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.



- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.
- J. Patching:
  - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  - 2. Match color, texture, and appearance.
  - 3. Make neat transitions. Where new work abuts or aligns with existing, perform a smooth and even transition.
  - 4. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- K. Visual/Quality Limitations
  - 1. Do not cut-and-patch work exposed to view, exterior and interior, in a manner resulting in noticeable reduction of visual qualities and similar qualities, as judged by Architect Engineer.
  - 2. Engage the original installer/fabricator or, if not available, an acceptable equivalent entity, to perform cutting and patching.

### **3.10 PROTECTION OF INSTALLED WORK**

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

### **3.11 SYSTEM STARTUP**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect Engineer and owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

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

**3.12 DEMONSTRATION AND INSTRUCTION**

- A. See Section 01 79 00 - Demonstration and Training.

**3.13 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93.

**3.14 FINAL CLEANING**

- A. Execute final cleaning prior to final project assessment.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces,
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Clean filters of operating equipment.

**3.15 CLOSEOUT PROCEDURES**

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect Engineer and Owner.
- B. Notify Architect Engineer when work is considered ready for Substantial Completion.
- C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect Engineer's review.
- D. Owner will occupy all of the building.
- E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- F. Notify Architect Engineer when work is considered finally complete.
- G. Complete items of work determined by Architect Engineer's final inspection.

**3.16 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION**

**SECTION 01 78 00**  
**CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

**1.02 RELATED REQUIREMENTS**

- A. Section 00 72 00 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

**1.03 SUBMITTALS**

- A. Project Record Documents: Submit documents to Architect Engineer with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect Engineer will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect Engineer comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed shop drawings, product data, and samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.

- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured depths of foundations in relation to finish first floor datum.
  - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 4. Field changes of dimension and detail.
  - 5. Details not on original Contract drawings.

### **3.02 OPERATION AND MAINTENANCE DATA**

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
  - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

### **3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Include performance curves, with engineering data and tests.
  - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- O. Include test and balancing reports.
- P. Additional Requirements: As specified in individual product specification sections.

### **3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS**

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect Engineer, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

### **3.06 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for

items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

**END OF SECTION**

**SECTION 01 79 00**  
**DEMONSTRATION AND TRAINING**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
  - 1. All software-operated systems.
  - 2. HVAC systems and equipment.
  - 3. Plumbing equipment.
  - 4. Electrical systems and equipment.
  - 5. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
  - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
  - 2. Finishes, including flooring, wall finishes, ceiling finishes.
  - 3. Fixtures and fittings.
  - 4. Items specified in individual product Sections.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
  - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
  - 2. Submit one copy to the Commissioning Authority, not to be returned.
  - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
  - 1. Submit to Architect Engineer for transmittal to Owner.
  - 2. Submit to Commissioning Authority for review and inclusion in overall training plan.
  - 3. Submit not less than four weeks prior to start of training.
  - 4. Revise and resubmit until acceptable.
  - 5. Provide an overall schedule showing all training sessions.
  - 6. Include at least the following for each training session:
    - a. Identification, date, time, and duration.
    - b. Description of products and/or systems to be covered.
    - c. Name of firm and person conducting training; include qualifications.
    - d. Intended audience, such as job description.
    - e. Objectives of training and suggested methods of ensuring adequate training.
    - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
    - g. Media to be used, such as slides, hand-outs, etc.
    - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
  - 1. Include applicable portion of O&M manuals.
  - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
  - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.

- D. Training Reports:
  - 1. Identification of each training session, date, time, and duration.
  - 2. Sign-in sheet showing names and job titles of attendees.

#### **1.04 QUALITY ASSURANCE**

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
  - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
  - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **3.01 DEMONSTRATION - GENERAL**

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
  - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
  - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
  - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

#### **3.02 TRAINING - GENERAL**

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
  - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
  - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
  - 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:
  - 1. Review the applicable O&M manuals.



2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
  3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
  4. Provide hands-on training on all operational modes possible and preventive maintenance.
  5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
  6. Discuss common troubleshooting problems and solutions.
  7. Discuss any peculiarities of equipment installation or operation.
  8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
  9. Review recommended tools and spare parts inventory suggestions of manufacturers.
  10. Review spare parts and tools required to be furnished by Contractor.
  11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 02 41 00**  
**DEMOLITION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Selective demolition of built site elements.

**1.02 RELATED REQUIREMENTS**

- A. Section 011000 (01100) - Summary: Limitations on Contractor's use of site and premises.
- B. Section 015000 (01500) - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 017000 (01700) - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- D. Section 311000 (02230) - Site Clearing: Vegetation and existing debris removal.
- E. Section 312323 (02316) - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

**1.03 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2009.

**1.04 SUBMITTALS**

- A. See Section 013000 (01300) - Administrative Requirements, for submittal procedures.

**PART 2 PRODUCTS -- NOT USED**

**PART 3 EXECUTION**

**3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. Comply with other requirements specified in Section 017000 (01700).
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Comply with applicable requirements of NFPA 241.
  - 3. Use of explosives is not permitted.
  - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  - 5. Provide, erect, and maintain temporary barriers and security devices.
  - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  - 8. Do not close or obstruct roadways or sidewalks without permit.
  - 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
  - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Protect existing structures and other elements that are not to be removed.
  - 1. Provide bracing and shoring.
  - 2. Prevent movement or settlement of adjacent structures.
  - 3. Stop work immediately if adjacent structures appear to be in danger.

- E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- F. If hazardous materials are discovered during removal operations, stop work and notify Architect Engineer and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- G. Partial Removal of Walks: Neatly saw cut at right angle to surface.

**3.02 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

**SECTION 03 30 00**  
**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete foundations and anchor bolts for pre-engineered building.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Concrete curing.

**1.02 RELATED REQUIREMENTS**

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Cast-in-place concrete work will be paid for by the unit price method.
- B. See Section 01 22 00 - Unit Prices, for additional unit price requirements.
- C. Concrete - Slab-on-Fill or Slab-on-Grade: Includes formwork as specified in Section 03 10 00, reinforcement as specified in Section 03 20 00, concrete, placement accessories, consolidating and leveling, troweling, and curing. Measurement by:
  - 1. Cubic yard.
- D. Concrete - Grouting: Includes preparation of substrate, grout, placement, consolidating, troweling, and curing. Measurement by the cubic yard.
- E. Construction Joint Devices: Includes component, accessories, and installation. Measurement by the linear foot.

**1.04 REFERENCE STANDARDS**

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2010.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- C. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010.
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- F. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
- G. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- H. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
- J. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International; 2004.
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Billet-Steel Bars for Concrete Reinforcement; 2013.
- L. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2013.
- M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

- N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012a.
- O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2013.
- P. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
- Q. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
- R. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- S. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.
- T. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2012.
- U. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- V. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- W. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- X. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes; 2001 (Reapproved 2012).
- Y. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.
- Z. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2011.
- AA. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999 (Reapproved 2008).
- AB. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2013.
- AC. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2012.
- AD. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.
- AE. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2010.
- AF. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 2011.
- AG. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
- AH. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2010.
- AI. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).
- AJ. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.
- AK. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
  - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

- C. Mix Design: Submit proposed concrete mix design.
  - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
  - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
- D. Samples: Submit samples of underslab vapor retarder to be used.

## **1.06 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
  - 1. Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

## **PART 2 PRODUCTS**

### **2.01 FORMWORK**

- A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
  - 1. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

### **2.02 REINFORCEMENT**

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
  - 1. Type: Deformed billet-steel bars.
  - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, plain type.
  - 1. Form: Flat sheets.
  - 2. Mesh Size and Wire Gage: As indicated on drawings.
- C. Reinforcement Accessories:
  - 1. Tie Wire: Annealed, minimum 16 gage.
  - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

### **2.03 CONCRETE MATERIALS**

- A. Cement: ASTM C150, Type I - Normal Portland type.
  - 1. Acquire all cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C 33.
  - 1. Acquire all aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Calcined Pozzolan: ASTM C618, Class N.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
- F. Water: Clean and not detrimental to concrete.

### **2.04 ADMIXTURES**

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. Accelerating Admixture: ASTM C494/C494M Type C.
- D. Retarding Admixture: ASTM C494/C494M Type B.
- E. Water Reducing Admixture: ASTM C494/C494M Type A.

## 2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
  - 1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
  - 2. Products:
    - a. Insulation Solutions, Inc; Viper VaporCheck II 15-mil (Class A): [www.insulationsolutions.com](http://www.insulationsolutions.com).
    - b. Stego Industries, LLC; Stego Wrap Vapor Barrier 15-mil (Class A): [www.stegoindustries.com](http://www.stegoindustries.com).
    - c. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils: [www.wrmeadows.com](http://www.wrmeadows.com).
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
  - 1. ASTM C1107/C1107M; Grade A, B, or C.
  - 2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,400 pounds per square inch.

## 2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059 Type II.
- B. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
  - 1. Size: 1/2 inch throat, 1/2 inch deep.
- C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
  - 1. Material: Closed-cell, non-absorbent, compressible polyethylene or polymer foam in sheet form.
- D. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

## 2.07 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing and Sealing Compound: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C309.
- C. Moisture-Retaining Sheet: ASTM C171.
  - 1. Curing paper, regular.
  - 2. Polyethylene film, clear, minimum nominal thickness of 0.0040 in..
  - 3. White-burlap-polyethylene sheet, weighing not less than 10 oz/per linear yd, 40 inches wide.
- D. Water: Potable, not detrimental to concrete.

## 2.08 CONCRETE MIX DESIGN

- A. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- B. Normal Weight Concrete:
  - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch.
  - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
  - 3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
  - 4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.



5. Water-Cement Ratio: Maximum 40 percent by weight.
6. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
7. Maximum Slump: 3 inches.
8. Maximum Aggregate Size: 5/8 inch.

## **2.09 MIXING**

- A. Transit Mixers: Comply with ASTM C94/C94M.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

### **3.02 PREPARATION**

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
  1. Use latex bonding agent only for non-load-bearing applications.
- D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

### **3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS**

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

### **3.04 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- D. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

### **3.05 SLAB JOINTING**

- A. Locate joints as indicated on the drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

### **3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES**

- A. Maximum Variation of Surface Flatness:
  1. Exposed Concrete Floors: 1/4 inch in 10 ft.

2. Under Seamless Resilient Flooring: 1/4 inch in 10 ft.
  3. Under Carpeting: 1/4 inch in 10 ft.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

### **3.07 CONCRETE FINISHING**

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
  2. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
- C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

### **3.08 CURING AND PROTECTION**

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:
1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
  2. Final Curing: Begin after initial curing but before surface is dry.

### **3.09 DEFECTIVE CONCRETE**

- A. Repair or replacement of defective concrete will be determined by the Architect Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

### **3.10 PROTECTION**

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

**END OF SECTION**

**SECTION 05 12 00**  
**STRUCTURAL STEEL FRAMING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Structural steel framing members, support members, suspension cables, sag rods, and struts.
- B. Base plates, shear stud connectors and expansion joint plates.
- C. Grouting under base plates.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

**1.04 REFERENCE STANDARDS**

- A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2011.
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2010.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- E. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- H. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel; 2004 (Reapproved 2009).
- I. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.
- J. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
- K. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2013.
- L. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use; 2010.
- M. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2012.
- N. ASTM A490M - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric); 2012.
- O. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- P. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.
- Q. ASTM A514/A514M - Standard Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2014.
- R. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2005 (Reapproved 2009).

- S. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2007a (Reapproved 2014).
- T. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric]; 2007.
- U. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2013a.
- V. ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point with Atmospheric Corrosion Resistance; 2010.
- W. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011.
- X. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2013.
- Y. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability and Ultra-High Strength; 2014.
- Z. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
- AA. ASTM E94 - Standard Guide for Radiographic Examination; 2004 (Reapproved 2010).
- AB. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2013.
- AC. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.
- AD. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2014.
- AE. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.
- AF. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2013.
- AG. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.
- AH. ASTM F1852 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2011.
- AI. ASTM F2280 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2012.
- AJ. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.
- AK. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010 w/Errata.
- AL. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.
- AM. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).
- AN. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
  - 2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

## 1.06 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel Shapes, Plates, and Bars: ASTM A 242/A 242M high-strength, corrosion-resistant structural steel.
- C. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.
- D. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
- E. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 or A325M, Type 1, medium carbon, galvanized, with matching compatible ASTM A563 or A563M nuts and ASTM F436 washers.
- F. Headed Anchor Rods: ASTM A 307, Grade C, plain.
- G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- H. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
- I. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
- J. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

### 2.02 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

### 2.03 FINISH

- A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
- B. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

## PART 3 EXECUTION

### 3.01 ERECTION

- A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".
- B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Do not field cut or alter structural members without approval of Architect Engineer.
- D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- E. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

### 3.02 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

**3.03 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.

**END OF SECTION**

**SECTION 05 31 00**  
**STEEL DECKING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Roof deck.
- B. Supplementary framing for openings up to and including 18 inches.
- C. Bearing plates and angles.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 12 00 - Structural Steel: Placement of embedded steel anchors for bearing plates in cast-in-place concrete.

**1.03 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.
- B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2013.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- D. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2013.
- G. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.
- H. ASTM E384 - Standard Test Method for Knoop and Vickers Hardness of Materials; 2011e1.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010 w/Errata.
- J. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 2008.
- K. FM DS 1-28 - Wind Design; 2007.
- L. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2006.
- M. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- N. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.
- O. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; ICC Evaluation Service, Inc.; 2010 (R2013).
- P. SDI (DM) - Publication No.31, Design Manual for Composite Decks, Form Decks, Roof Decks; Steel Deck Institute; 2007.
- Q. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); The Society for Protective Coatings; 2002 (Ed. 2004).
- R. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

1. Cellular Floor Deck Electrical Raceway System: Include insert spacing and height and trench header duct layout.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

### **1.05 QUALITY ASSURANCE**

- A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Arkansas.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

### **2.02 STEEL DECK**

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
1. Calculate to structural working stress design and structural properties specified.
- B. Roof Deck: Non-composite type, fluted steel sheet:
1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
  2. Minimum Base Metal Thickness: 20 gage, 0.0359 inch.
  3. Nominal Height: 1-1/2 inch.
  4. Profile: Fluted; SDI NR.

### **2.03 ACCESSORY MATERIALS**

- A. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
- B. Fasteners: Galvanized hardened steel, self tapping.

### **2.04 FABRICATED DECK ACCESSORIES**

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 20 gage, 0.0359 inch thick sheet steel; of profile and size as indicated; finished same as deck.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions prior to beginning work.

### **3.02 INSTALLATION**

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On steel supports provide minimum 1-1/2 inch bearing.

**END OF SECTION**



**SECTION 06 10 00**  
**ROUGH CARPENTRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Structural dimension lumber framing.
- B. Rough opening framing for doors, windows, and roof openings.
- C. Sheathing.
- D. Preservative treated wood materials.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

**1.03 REFERENCE STANDARDS**

- A. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; American Forest and Paper Association; 2012.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2012.
- E. ICC-ES AC308 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc; 2013.
- F. PS 1 - Structural Plywood; 2009.
- G. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; National Institute of Standards and Technology, U.S. Department of Commerce; 2010.
- H. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology, Department of Commerce; 2010.
- I. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2014.
- J. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; West Coast Lumber Inspection Bureau; 2004, and supplements.
- K. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 2011.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.

2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee ([www.alsc.org](http://www.alsc.org)) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

## **2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 by 2 through 2 by 6 ):
  1. Species: Southern Pine.
  2. Grade: No. 2.
- E. Joist Framing (2 by 6 through 4 by 16 ):
  1. Species: Southern Pine.
  2. Grade: No. 1 & Btr.

## **2.03 CONSTRUCTION PANELS**

- A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
  1. Grade: Structural 1 Sheathing.
  2. Bond Classification: Exposure 1.
  3. Performance Category: 5/8 PERF CAT.
  4. Span Rating: 40/20.
  5. Edges: Square.
- B. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.

## **2.04 ACCESSORIES**

- A. Fasteners and Anchors:
  1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

## **2.05 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
  1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Preservative Treatment:
  1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
    - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

### **3.02 INSTALLATION - GENERAL**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

### **3.03 FRAMING INSTALLATION**

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.
- E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

### **3.04 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

### **3.05 INSTALLATION OF CONSTRUCTION PANELS**

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
  - 1. Nail panels to framing; staples are not permitted.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws.

### **3.06 TOLERANCES**

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

### **3.07 CLEANING**

- A. Waste Disposal: Comply with the requirements of Section 01 74 19.
  - 1. Comply with applicable regulations.
  - 2. Do not burn scrap on project site.
  - 3. Do not burn scraps that have been pressure treated.
  - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 06 41 00**  
**ARCHITECTURAL WOOD CASEWORK**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Preparation for installing utilities.

**1.03 REFERENCE STANDARDS**

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- B. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).
- C. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- C. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

**1.05 QUALITY ASSURANCE**

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
- B. Perform work in accordance with AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards for grades of interior architectural woodwork, construction, finishes, and other requirements, unless other quality is indicated for specific items.
  - 1. Comply with requirement for Custom Grade, unless other quality is indicated for specific items.
  - 2. Perform work in accordance with requirements of AWI Quality Certification Program (QCP).

**PART 2 PRODUCTS**

**2.01 CABINETS**

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards (AWS) for Custom Grade.
- B. Plastic Laminate Faced Cabinets: Custom grade.

**2.02 WOOD-BASED COMPONENTS**

- A. Provide wood products with no urea-formaldehyde added.
- B. Medium Density Fiberboard (MDF): Not permitted.
- C. Particleboard (MDP): Type complying with AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.

### 2.03 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- B. Thermoset decorative overlays (Melamine Panels) may be used for casework cabinet interior.

### 2.04 COUNTERTOPS

- A. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated, with decorative 3 mm PVC edge.

### 2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
  - 1. Color: As selected by Architect Engineer from manufacturer's standard range.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- E. Concealed Joint Fasteners: Threaded steel.

### 2.06 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
- C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
- D. Catches: Magnetic.
- E. Drawer Slides:
  - 1. Type: Full extension with overtravel.
  - 2. Static Load Capacity: Extra Heavy Duty grade.
  - 3. Mounting: Side mounted.
  - 4. Stops: Integral type.
  - 5. Features: Provide self closing/stay closed type.
  - 6. Products:
    - a. Accuride International, Inc: [www accuride.com](http://www accuride.com).
    - b. Grass America Inc: [www.grassusa.com](http://www.grassusa.com).
    - c. Hettich America, LP; KA (ball bearing): [www.hettichamerica.com](http://www.hettichamerica.com).
    - d. Knap & Vogt Manufacturing Company: [www.knapeandvogt.com](http://www.knapeandvogt.com).
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Hinges: European style concealed self-closing type, steel with polished finish.
  - 1. Products:
    - a. Grass America Inc: [www.grassusa.com](http://www.grassusa.com).
    - b. Hardware Resources: [www.hardwareresources.com](http://www.hardwareresources.com).
    - c. Hettich America, LP: [www.hettichamerica.com](http://www.hettichamerica.com).
    - d. Julius Blum, Inc: [www.blum.com](http://www.blum.com).
    - e. Substitutions: See Section 01 60 00 - Product Requirements.

### 2.07 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
  - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use concealed joint fasteners to align and secure adjoining cabinet units.

#### **3.02 ADJUSTING**

- A. Adjust moving or operating parts to function smoothly and correctly.

#### **3.03 CLEANING**

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 07 25 00**  
**WEATHER BARRIERS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

**1.03 DEFINITIONS**

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

**1.04 REFERENCE STANDARDS**

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
- C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2013.
- D. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.
- E. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc.; 2013.

**1.05 SUBMITTALS**

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

**PART 2 PRODUCTS**

**2.01 WEATHER BARRIER ASSEMBLIES**

- A. Air Barrier:
  - 1. On outside surface of sheathing of exterior walls use air barrier sheet, mechanically fastened type.

**2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)**

- A. Air Barrier Sheet, Mechanically Fastened:
  - 1. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
  - 2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
  - 3. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 6 months weather exposure.
  - 4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E84.
  - 5. Water Resistance: Comply with applicable water-resistive requirements of ICC-ES Acceptance Criteria AC38.
  - 6. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material; unless otherwise specified.
  - 7. Products:

- a. DuPont Building Innovations; Tyvek Commercial Wrap with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: [www.dupont.com](http://www.dupont.com).
- b. DuPont Building Innovations; Tyvek Commercial Wrap D with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: [www.dupont.com](http://www.dupont.com).
- c. National Shelter Products, Inc.: [www.drylinewrap.com](http://www.drylinewrap.com).
- d. Pactiv Corporation; GreenGuard C2000 Building Wrap: [greenguard.pactiv.com](http://greenguard.pactiv.com).
- e. Substitutions: See Section 01 60 00 - Product Requirements.

### 2.03 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
- B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970, except slip resistance requirement is waived if not installed on a roof.
  1. Products:
    - a. DuPont Building Innovations; FlexWrap NF: [www.dupont.com](http://www.dupont.com).
    - b. DuPont Building Innovations; StraightFlash: [www.dupont.com](http://www.dupont.com).
    - c. DuPont Building Innovations; StraightFlash VF: [www.dupont.com](http://www.dupont.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

### 3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

### 3.03 INSTALLATION

- A. Install materials in strict accordance with manufacturer's instructions.
- B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Mechanically Fastened Sheets - On Exterior:
  1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
  2. Overlap seams as recommended by manufacturer but at least 6 inches.
  3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
  4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
  5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
  6. Where stud framing rests on concrete or masonry, extend lower edge of sheet at least 4 inches below bottom of framing and seal to foundation with sealant.
  7. Install air barrier and vapor retarder UNDER jamb flashings.
  8. Install head flashings under weather barrier.
  9. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
- D. Openings and Penetrations in Exterior Weather Barriers:
  1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.

2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

#### **3.04 FIELD QUALITY CONTROL**

- A. Do not cover installed weather barriers until required inspections have been completed.
- B. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- C. Take digital photographs of each portion of the installation prior to covering up.

#### **3.05 PROTECTION**

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 07 41 13**  
**METAL ROOF PANELS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Metal roofing system of prefinished, preformed steel panels of type to match existing and in accordance with drawings.
- B. Fastening system.
- C. Factory finishing.
- D. Accessories and miscellaneous components.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Storage and handling requirements and recommendations.
  - 2. Installation methods.
- B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
  - 1. Show work to be field-fabricated or field-assembled.
  - 2. Include structural analysis signed and sealed by qualified structural engineer, indicating conformance of roofing system to specified loading conditions.
- C. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
  - 1. Include typical panel joint in sample.

**PART 2 PRODUCTS**

**2.01 METAL ROOFING**

- A. Metal Roofing: Provide complete roofing assemblies to match existing, including roof panels, clips, fasteners, connectors, and miscellaneous accessories.

**2.02 PANEL FINISH**

- A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color and gloss to match existing.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
  - 1. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, rib closures, and similar roof accessory items.
- C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 07 46 33**  
**PLASTIC SIDING**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Vinyl siding and trim.

**1.03 REFERENCE STANDARDS**

- A. ASTM D3679 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding; 2011.

**1.04 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- B. Samples: Provide samples in colors specified, not less than 12 inches in length.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. General Requirements:
  - 1. Siding: Comply with ASTM D3679 Class 1.
- B. Horizontal Vinyl Siding Match Existing.
  - 1. Length: 12 feet, minimum.
- C. Accessories: Provide coordinating accessories made of same material as required for complete and proper installation whether or not specifically shown on the drawings.
- D. Fasteners: Aluminum nails, alloy 5056 or 6110, with minimum tensile strength of 63,000 pounds per square inch; length as required to penetrate framing at least 3/4 inch.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install siding and trim in accordance with manufacturer's printed installation instructions.
- B. Attach securely to framing, not sheathing, with horizontal components true to level and vertical components true to plumb, providing a weather resistant installation.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 07 46 46**  
**FIBER CEMENT SIDING**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Wood-fiber cement siding.

**1.03 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Manufacturer's requirements for related materials to be installed by others.
  - 2. Preparation instructions and recommendations.
  - 3. Storage and handling requirements and recommendations.
  - 4. Installation methods, including nail patterns.
- B. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).

**PART 2 PRODUCTS**

**2.01 SIDING**

- A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
  - 1. Style: Standard lap style.
  - 2. Texture: Smooth.
  - 3. Length: 12 ft, nominal.
  - 4. Width (Height): As required to match existing vinyl siding.
  - 5. Thickness: 5/16 inch, nominal.
  - 6. Finish: Factory applied primer.

**2.02 ACCESSORIES**

- A. Trim: Same material and texture as siding.
- B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and recommendations.
  - 1. Read warranty and comply with all terms necessary to maintain warranty coverage.
  - 2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
  - 3. Use trim details indicated on drawings.
  - 4. Touch up all field cut edges before installing.
  - 5. Pre-drill nail holes if necessary to prevent breakage.
- B. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- C. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Paint all exposed cut edges.
- D. Finish Painting: Specified in Section 09 90 00.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 07 52 05**  
**ROOFING SYSTEM MODIFICATIONS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Cutting and patching of roofing to incorporate alterations and/or new Work. Extent of roofing system modification includes work as indicated on drawings and by provisions of this section
- B. Adding new roof membrane flashing.
- C. Assign work to roofing installer acceptable to manufacturer issuing warranty/bond for existing roof.
- D. Schedule alteration work as required to maintain roof in a watertight condition.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers. Representative of roof manufacturer shall attend unless waived by Owner.
- B. Roof modification work shall match existing. Work shall be acceptable to roof membrane manufacture. If existing roofing warranty/bond is valid, new work shall be performed in accordance to the manufacturer's requirement in order not void any warranty/bond. Warrant roof penetration work for remaining period of existing warranty/bond, and in no case less than five years from substantial completion. Installer shall be acceptable to roofing membrane manufacturer.

**1.04 SUBMITTALS**

- A. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.05 QUALITY ASSURANCE**

- A. Roofing installer to be approved in writing by roofing manufacturer.

**1.06 WARRANTY**

- A. Correct defective Work within a two year period after Date of Substantial Completion.
- B. Amend manufacturer's warranty/bond for remaining period of existing roof's warranty/bond if applicable.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Roofing membrane and flashing shall match existing and shall be acceptable to roofing manufacturer.
- B. Provide modified bitumen base flashing system to match existing.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Schedule work as required to maintain roof in a watertight condition.
- B. Install in accordance with manufacturer's instructions and as required to maintain existing roof warranty/bond. If no warranty/bond exist, provide flashing system in accordance with Roofing Manufacturer's written recommendations. If roofing manufacturer's information is not provided by Owner, then follow guidelines provided by NRCA at a minimum.
- C. Comply with manufacturer's recommendations and safety requirements.

- D. SMANCA and NRCA Details: Conform work with details shown, and with applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMANCA. Comply with installation details of "Roofing and Waterproofing Manual" by NRCA.
- E. Flashing and Stripping: Provide base flashing system at existing roof as recommended by manufacturer.

**3.02 FIELD QUALITY CONTROL**

- A. Final Roof Modification Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect Engineer.
- B. Notify Architect Engineer 48 hours in advance of the date and time of inspection.

**END OF SECTION**

**SECTION 07 84 00**  
**FIRESTOPPING**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Firestopping systems.
- B. Firestopping of all joints, penetrations, and perimeter containment in fire-resistance rated and smoke-resistant assemblies and construction conditions, whether indicated on drawings or not, and other openings indicated.

**1.03 SUBMITTALS**

- A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Certificate from authority having jurisdiction indicating approval of materials used.
- F. Maintenance Manual: Including schedule of firestopping systems provided, systems data sheets, and instructions how to maintain and/or retrofit them when needed.

**1.04 QUALITY ASSURANCE**

- A. For sole source responsibility obtain firestop systems for each type of penetration or joint opening and construction condition indicated from a single manufacturer to the greatest extent possible.
- B. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
  - 1. Performance requirements shall meet FM DS 1-21 and UL classified system as indicated, but not necessarily limited to, schedule at end of this section.
    - a. Listing in the current-year classification or certification books of UL and FM Approval Guide will be considered as constituting an acceptable test report.
  - 2. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
  - 3. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.
  - 4. Provide materials that expand to fill cavities or adhesion to substrates, and that will maintain seal under normal expected movements of substrates.
- C. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated, ASTM E 814, and ASTM E 119.
  - 1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
  - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at [www.icc-es.org](http://www.icc-es.org) will be considered as constituting an acceptable test report.
  - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- E. Installer Qualifications: Company specializing in performing the work of this section and:
  - 1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, or meeting any two of the following requirements.

- a. With minimum 3 years documented experience installing work of this type.
- b. Able to show at least 5 satisfactorily completed projects of comparable size and type.
- c. Licensed by authority having jurisdiction.
- d. Trained by firestopping manufacturer.

F. Installing Mechanic's Qualifications: Trained by firestopping manufacturer.

## **PART 2 PRODUCTS**

### **2.01 FIRESTOPPING SYSTEMS**

- A. Provide firestopping system components designed to resist the spread of fire and gases through openings made by floor and wall penetrations.
- B. Systems used shall be listed in FM P7825 - Approval Guide.
- C. Systems used shall be listed in the UL Fire Resistance Directory under Through-Penetrations Firestop Systems (XHEZ) and Through-Penetration Firestop Devices (XHCR).
- D. Firestopping: Any material meeting requirements.
  1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E 814 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and that meets all other specified requirements.
- E. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches or less: Any material meeting requirements.
  1. Floors: UL Design No. C-AJ-1226, F Rating 2 hour.
- F. Firestopping at Non-Insulated Mechanical Ductwork Without Dampers, openings of 8 inches or more: Any material meeting requirements.
  1. Area Separation Walls: UL Design No. W-L-7040 and W-L-7042, F Rating 2 hour.

### **2.02 MATERIALS**

- A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Acceptable manufacturers and products shall be those listed FM P7825 - Approval Guide and in the latest UL Fire Resistance Directory.
- C. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
  1. Shrinkage: maximum 5 percent.
  2. Density: 1.4 g/cu cm.
  3. Durability and Longevity: Permanent.
  4. Color: red.
  5. Manufacturers:
    - a. 3M Fire Protection Products; Product FB 2000 NS: [www.3m.com/firestop](http://www.3m.com/firestop).
    - b. Specified Technologies, Inc: [www.stifirestop.com](http://www.stifirestop.com).
    - c. Hilti; Product CP 601s: [www.us.hilti.com](http://www.us.hilti.com).
    - d. Substitutions: See Section 016000 - Product Requirements.
- D. Intumescent Sealant: Compound which expands on exposure to surface heat gain; conforming to the following:
  1. Potential Expansion: Minimum 300 percent.
  2. Density: 1.5 lb/cu ft.
  3. Durability and Longevity: Permanent.
  4. Color: Red.
  5. Manufacturers:
    - a. 3M Fire Protection Products; Product IC 15WB: [www.3m.com/firestop](http://www.3m.com/firestop).
    - b. Hilti, Inc; Product FS-One: [www.us.hilti.com](http://www.us.hilti.com).
    - c. Specified Technologies, Inc: [www.stifirestop.com](http://www.stifirestop.com).
    - d. Substitutions: See Section 016000 - Product Requirements.

- E. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify openings are ready to receive the work of this section.

#### **3.02 PREPARATION**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

#### **3.03 INSTALLATION**

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authority having jurisdiction.
- C. Install labeling for each penetration indicating firestopping system number and protection rating provided.
- D. Label each penetration, identifying manufacture and firestopping system used. Label both sides of penetration, except where exposed in finished space.

#### **3.04 CLEANING**

- A. Clean adjacent surfaces of firestopping materials.

#### **3.05 PROTECTION**

- A. Protect adjacent surfaces from damage by material installation.

#### **3.06 FIRE AND SMOKE PARTITION IDENTIFICATION**

- A. Corridor partitions, smokestop partitions, horizontal exit partitions, exit enclosures, and fire walls as indicated on drawings shall be permanently identified on both sides with a continuous red line and signs or stenciling. Such identification shall be above any decorative ceiling and in concealed spaces. Wording as follows: "\_\_\_ Hour Fire Barrier Protect All Openings", "\_\_\_ Hour Fire and Smoke Barrier Protect All Openings", or "Smoke Barrier Protect All Openings."
- B. During construction, provide and maintain either the permanent identification specified above or other suitable temporary identification.

#### **3.07 LABELING**

- A. Upon completion, affix label to or adjacent to each firestopped penetration in time-rated assemblies indicating material, system number, and proper replacement if later disturbed.

#### **3.08 SCHEDULE**

- A. Systems and applications include, but are not necessarily limited to the following. All systems indicated are UL system numbers. See UL FireResistance Directory (Volume II) and FM P7825 - Approval Guide. Should a penetration be encountered which is not listed below Contractor shall use a FM approved and UL classified system recommended by manufacturer, subject to requirements of this section.

- | 1. PENETRANT TYPE   | UL SYSTEM NUMBERS   |
|---------------------|---|
| a. Plastic Pipe:    | CAJ2005, CAJ2004, CAJ2001, WL2002, FA2002, CAJ2057, WL2047.                   |
| b. Metal Pipe:      | CAJ0004, CAJ1017, CAJ1021, CBJ1020, CBJ1021, WL1001, CAJ1090, WL1028, WL1029. |
| c. Insulated Pipe:  | CAJ5001, CAJ5002, FA1002, WL1001, WL1002, WL5009, WL5005, CAJ5029, WL5014.    |
| d. Insulated Cable: | CAJ3001, CAJ3021, WL3032.   |
| e. Bus Duct:        | FA6001, CAJ6001, CAJ1082.   |
| f. Cable Tray       | CAJ4003, CBJ4011, WL4004, CAJ8016.  |

CREMATORIUM ADDITION  
For Animal Village, City of Little Rock, Arkansas

CoLR Bid# 15128  
(AE#2014-205-10)

- g. HVAC Ducts CAJ1044, CAJ5001, WL1001, WL1003, WL5010, WL7001.
- h. Blank Openings CAJ0014, CAJ0015, CBJ5003, CAJ0007.

**END OF SECTION**



**SECTION 07 90 05**  
**JOINT SEALERS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Sealants and joint backing.

**1.03 SUBMITTALS**

- A. Samples: Submit two samples, 6 x 1/2 inch in size illustrating sealant colors for selection.
- B. Manufacturer's Installation Instructions: Indicate special procedures.

**1.04 FIELD CONDITIONS**

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Silicone Sealants:
  - 1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Momentive Performance Materials, Inc (formerly GE Silicones): [www.momentive.com](http://www.momentive.com).
  - 3. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 4. BASF Construction Chemicals-Building Systems: [www.chemrex.com](http://www.chemrex.com).
- B. Acrylic Emulsion Latex Sealants:
  - 1. Bostik Inc; Product Chem-Calk 600: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Pecora Corporation; Product AC-20: [www.pecora.com](http://www.pecora.com).
  - 3. BASF Construction Chemicals-Building Systems: [www.chemrex.com](http://www.chemrex.com).

**2.02 ACCESSORIES**

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

**3.02 PREPARATION**

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

**3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

**3.04 CLEANING**

- A. Clean adjacent soiled surfaces.

**END OF SECTION**

**SECTION 08 11 13**  
**HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Non-fire-rated steel doors and frames.
- B. Steel frames for wood doors.
- C. Fire-rated steel doors and frames.
- D. Thermally insulated steel doors.

**1.03 RELATED REQUIREMENTS**

- A. Section 08 71 00 - Door Hardware.
- B. Section 09 90 00 - Painting and Coating: Field painting.

**1.04 SUBMITTALS**

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- C. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Maintain at the project site a copy of all reference standards dealing with installation.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Steel Doors and Frames:
  - 1. Assa Abloy Ceco, Curries, or Fleming: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. De La Fontaine Inc: [www.delafontaine.com](http://www.delafontaine.com).
  - 3. Republic Doors: [www.republicdoor.com](http://www.republicdoor.com).
  - 4. Steelcraft, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.

**2.02 DOORS AND FRAMES**

- A. Requirements for All Doors and Frames:
  - 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 2. Door Top Closures: Flush with top of faces and edges.
  - 3. Door Edge Profile: Beveled on both edges.
  - 4. Door Texture: Smooth faces.
  - 5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
  7. Galvanizing where indicated: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating thickness
  8. 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 requirement, 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, comply with the most stringent.

### 2.03 STEEL DOORS

- A. Exterior Doors:
1. Grade: ANSI A250.8 - SDI-100; Level 3 - Extra Heavy-Duty, Physical Performance Level A, Model 2 - Seamless.
  2. Core: Polyurethane.
  3. Thickness: 1-3/4 inch.
  4. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
- B. Interior Doors, Non-Fire-Rated:
1. Grade: ANSI A250.8 - SDI-100; Level 2 - Heavy-Duty, Physical Performance Level B, Model 2 - Seamless.
  2. Core: Polyurethane.
  3. Thickness: 1-3/4 inch.
- C. Interior Doors, Fire-Rated:
1. Grade: ANSI A250.8 - SDI-100; Level 2 - Heavy-Duty, Physical Performance Level B, Model 2 - Seamless.
  2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
    - a. Provide units listed and labeled by UL (Underwriters Laboratories) - UL (BMD) or WH (Warnock Hersey) - ITS (DIR).
    - b. Attach fire rating label to each fire rated unit.
  3. Core: Mineral board.
  4. Thickness: 1-3/4 inch.

### 2.04 STEEL FRAMES

- A. General:
1. Comply with the requirements of grade specified for corresponding door, except:
    - a. ANSI A250.8 - SDI-100, Level 1 and 2 Door Frames: 16 gage, 0.053 inch, minimum thickness.
    - b. ANSI A250.8 - SDI-100, Level 3 Door Frames: 14 gage, 0.067 inch, minimum thickness.
    - c. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 - SDI-100, Level 1, 16 gage, 0.053 inch
  2. Finish: Same as for door.
  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: Face welded, seamless with joints filled.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
  2. Weatherstripping: Separate, see Section 08 71 00.
- C. Interior Door Frames, Non-Fire-Rated: Face welded type.

- D. Interior Door Frames, Fire-Rated: Face welded type.
  - 1. Fire Rating: Same as door, labeled.

### **2.05 ACCESSORY MATERIALS**

- A. Glazing: As specified in Section 08 80 00, factory installed.
- B. Astragals for Double Doors: Specified in Section 08 71 00.
  - 1. Exterior Doors: Steel, Z-shaped.
  - 2. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.
- C. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
- D. 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.
- E. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

### **2.06 FINISH MATERIALS**

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Factory Finish: Complying with ANSI A250.3, baked enamel will be acceptable.
  - 1. Color: As shown on drawings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

### **3.02 INSTALLATION**

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. In addition, install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Coordinate installation of hardware.
- E. Touch up damaged factory finishes.

### **3.03 ADJUSTING**

- A. Adjust for smooth and balanced door movement.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 08 14 16**  
**FLUSH WOOD DOORS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Flush wood doors; flush configuration; non-rated.

**1.03 RELATED REQUIREMENTS**

**1.04 REFERENCE STANDARDS**

- A. WDMA I.S.1-A - Architectural Wood Flush Doors; Window and Door Manufacturers Association; 2011.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Specimen warranty.
- D. Manufacturer's Installation Instructions: Indicate special installation instructions.
- E. Warranty, executed in Owner's name.

**1.06 QUALITY ASSURANCE**

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

**1.08 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Wood Veneer Faced Doors:
  - 1. Eggers Industries: [www.eggertindustries.com](http://www.eggertindustries.com).
  - 2. Graham Wood Doors: [www.grahamdoors.com](http://www.grahamdoors.com).
  - 3. Haley Brothers: [www.haleybros.com](http://www.haleybros.com).
  - 4. Marshfield DoorSystems, Inc: [www.marshfielddoors.com](http://www.marshfielddoors.com).
  - 5. VT Industries, Inc: [www.vtindustries.com](http://www.vtindustries.com).
  - 6. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.02 DOORS**

- A. All Doors: .
  - 1. Quality Level: Custom Grade, Standard Duty performance, in accordance with WDMA I.S.1-A.
  - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
  - 1. Provide solid core doors at all locations.

## **2.03 DOOR AND PANEL CORES**

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

## **2.04 DOOR FACINGS**

- A. Veneer Facing for Transparent Finish: Match existing wood doors in facility, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
  - 1. Vertical Edges: Compatible hardwood.

## **2.05 DOOR CONSTRUCTION**

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
  - 1. Provide solid blocks at lock edge for hardware reinforcement.
  - 2. Provide solid blocking for other throughbolted hardware.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
  - 1. Exception: Doors to be field finished.
- E. Provide edge clearances in accordance with the quality standard specified.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Field-Finished Doors: Trimming to fit is acceptable.
  - 1. Adjust width of non-rated doors by cutting equally on both jamb edges.
  - 2. Trim maximum of 3/4 inch off bottom edges.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.

**END OF SECTION**



**SECTION 08 71 00**  
**DOOR HARDWARE**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Commercial door hardware.
  - 2. Cylinders for doors specified in other Sections.
- B. See Division 08 door sections for astragals and door silencers.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Details of electrified door hardware, including wiring diagrams.
- D. Other Actions Submittals:
  - 1. Door Hardware Sets: Prepared by or under supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams.
    - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Document.
    - b. Content: Include the following information:
      - 1) Identification number, location, hand, fire rating and material of each door and frame.
      - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
      - 3) Complete designations of every item required for each door or opening including name and manufacturer.
      - 4) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
  - 2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks.

**1.04 QUALITY ASSURANCE**

- A. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant 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.
- B. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electric modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- C. Fire-Rated Door Assemblies: Assemblies complying with NEPA 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 251 and 252.
- D. Keying Conference: The supplier shall prepare a recommended keying schedule and include it in the hardware schedule for approval. Following approval, the supplier shall establish a meeting with the Owner or Owner's representative to review and gain approval of the final keying system. Confirmation of the meeting and attendees shall be given to the general Contractor in writing and four (4) final copies of the hardware schedule containing keying revisions shall be submitted to the general Contractor for his files and field use.

- E. Owner's Maintenance Package: The hardware supplier shall prepare a packet containing a complete up to date copy of the hardware schedule, two copies of any installation and or maintenance instructions for items provided on the project and two sets of installation and adjustment tools, including dogging keys and emergency keys for any hardware requiring these tools. The maintenance package is to be delivered to the General Contractor with the key control systems and the master keys.

#### **1.05 DELIVERY, STORAGE AND HANDLING**

- A. Deliver keys to Coordinator by registered mail or overnight package service.

#### **1.06 COORDINATION**

- A. Templates: Distribute door hardware template information for doors, frames, and other work specified to be factory prepared for installing door hardware.

#### **1.07 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fails in materials or workmanship within specified warranty period.
  - 1. Warranty Period: One (1) year from date of Substantial Completion, except as follows:
    - a. Manual Closers: Ten (10) years from date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.01 SCHEDULED DOOR HARDWARE**

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in door and frame schedule and door hardware sets indicated in Part 3 paragraphs "Door and Hardware Sets."
  - 1. Door hardware sets: Provide quantity, item, size, finish and color indicated products equivalent in function and comparable in quality to names products except as noted.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 paragraphs "Door and Hardware Sets." Products are identified by using door hardware designations, as follows:

#### **2.02 HINGES, GENERAL**

- A. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Hinge Base Metal: Unless otherwise indicated, provide the following.
  - 1. Interior Hinges: Steel with steel pin.
  - 2. Hinges for Fire-Rated Assemblies: Steel with steel pin.
- C. Fasteners: Comply with the following:
  - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
  - 2. Wood Screws: For wood doors and frames.
  - 3. Threaded-to-the-head wood screws: For fire-rated wood doors.
  - 4. Screws: Phillips flat-head, machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.
- D. Butt hinges are to be the type and weights indicated. Sizes are to be in accordance with the following:
  - 1. Thickness:
    - a. 1-3/4 Inches Thick Doors: 4-1/2 Inches.
    - b. 1-3/8 Inches Thick Doors: 3-1/2 Inches.
  - 2. Width:
    - a. Doors up to 42 Inches Wide: 4-1/2 Inches.
    - b. Doors 42 Inches Wide and Over: 5 Inches.
- E. 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.

### **2.03 HINGES**

- A. Butts and Hinges: BHMA A156.1
- B. Template Hinge Dimensions: BHMA A156.7
- C. Acceptable Manufacturers:
  1. Bommer Industries, Inc. (B)
  2. Hager Companies (H)
  3. McKinney Products Company, an ASSA ABLOY Group Company (Mc)
  4. PBB, Inc. (P)
  5. Ives (I)

### **2.04 LOCKS AND LATCHES, GENERAL**

- A. Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Locks are to be Best 93K series cylindrical locks conforming to ANSI A156.1 series 4000 Grade 1 and federal specifications series 161. Latch bolts are to have full 3/4-inch throw of the mechanical anti-friction type. Deadlocks are to have a full 1-inch throw with hardened steel inserts.
- D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors.
- E. Backset: 2-3/4 inches, unless otherwise indicated.
- F. Strikes: Manufacturer's standard strike with strike box for each latch bolt or lock bolt, with lip sized to meet conditions, finished to match door hardware set.
- G. Lock Functions: Function numbers and descriptions are indicated in door hardware sets.
- H. Acceptable Manufacturers:
  1. Substitutions: Not permitted.

### **2.05 AUXILIARY LOCKS AND LATCHES**

- A. Acceptable Manufacturers:
  1. Corbin Russwin (C)
  2. Sargent (SA)
  3. Falcon (F)
  4. Yale (Y)
  5. Best (B)

### **2.06 DOOR BOLTS**

- A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors.
- B. Manual Flush Bolts:
  1. Acceptable Manufacturers:
    - a. Door Controls International (DC)
    - b. Hager Companies (H)
    - c. Ives (I)
    - d. Rockwood Manufacturing (R)
- C. Automatic and Self-Latching Flush Bolts:
  1. Acceptable Manufacturers:
    - a. Door Control International (DC)
    - b. Glynn Johnson, an Ingersoll-Rand Company (GJ)
    - c. Hager Companies (H)
    - d. Ives (I)

- e. Rockwood Manufacturing (R)

## 2.07 KEYING

- A. All locks are to be subject to the existing key system.

## 2.08 CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
  - 1. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire Rated Hinged Doors: 5 lbf applied perpendicular to door.
    - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- B. Door Closers for Mean of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
- C. Surface Closers: Provide streamlined style with full covers and integral back check feature with an adjustable valve. Provide parallel arm brackets for all exterior out swinging doors and where required for closer to be located on non-public side of door, and as required by adjacent wall conditions, unless otherwise indicated.
  - 1. Provide closer with hold-open arms except where used in conjunction with UL rated doors or electric access control.
  - 2. Provide delayed action function where indicated in the door schedule.
- D. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."
- E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendation for size of door closers, and anticipated frequency of use. Provide size adjustable closers, adjustable to meet field conditions and requires for opening force.

## 2.09 PROTECTIVE TRIM UNITS

- A. Provide protection plates sized 1-1/2 inches less than door width for single door and 1 inch less than door width for pairs of doors, and by the following heights:
  - 1. Armor Plates: 36 inches unless otherwise noted.
  - 2. Kick Plates: 10 inches unless otherwise noted.
- B. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:
  - 1. Material: 0.050 inch thick stainless steel.
  - 2. Acceptable manufacturers:
    - a. Hager Companies (H)
    - b. Rockwood Manufacturing Company (R)
    - c. Ives (I)
    - d. Burns Manufacturing

## 2.10 STOPS AND HOLDERS

- A. Furnish wall mounted door stops where ever possible. Where wall stops are not practical, provide floor or base stops.
- B. Doors are to receive Trimco 1270WX or 1270WV stops. Where floor stops are necessary provide Trimco 7280. Where wall stops engage knobs with push buttons, provide Trimco 1270WV.
- C. Provide fasteners of the proper type for the wall and floor materials.

## 2.11 SOUND GASKETING

- A. Standard: BHMA A156.22
- B. General: Provide continuous sound Gasketing on doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb forming seal between door and frame.
  2. Meeting Stile Gasketing: Fasten to meeting stiles forming seal when doors are closed.
  3. Door Bottoms: Apply to bottom of door forming seal with threshold when door is closed.
- C. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency for sound ratings indicated based on testing according to ASTM E 1408.
- D. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks by manufacturer.
- E. Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- F. Acceptable Manufacturers:
1. Hager Companies (H)
  2. Pemko Manufacturing Company (PEM)
  3. Reese Enterprises (RE)
  4. Zero International (ZRO)

## 2.12 POWER SUPPLIES

- A. Power supplies are to be provided where indicated in the hardware sets.
- B. Power supplies are to be Schlage PS900 series.
- C. The type, model and quantity of power supplies are to be determined by the operational requirements of each opening and the number of openings that may be operated by a power supply.
- D. Acceptable Manufacturers:
1. Substitutions not permitted.

## 2.13 FABRICATION

- A. Base Metals: Produce door hardware units of base metals, fabricated by forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturers standard materials or forming methods if different from specified standard.
- B. Fasteners: Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finish heads to match surface of door hardware, unless otherwise indicated.
- C. Finishes:
1. The finish in general shall be satin chrome (BHMA 626 or BHMA 652).
  2. Satin stainless steel (BHMA 630) may be provided at the supplier's option.
  3. Satin stainless steel (BHMA 630) shall be provided for high frequency doors.
  4. Door closers shall be painted aluminum (BHMA 689).
  5. Gasketing is to be mill finish aluminum.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Steel Doors and Frames: Comply with DHI A115 Series. Drill and tap doors and frames for surface-applied door hardware according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.
- C. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
1. Standard Steel Door and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- D. Install each door hardware item to comply with manufacturers 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 reinstallation of surface

protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed or substrates involved.

- E. Adjustment: The installer shall make adjustments as necessary to insure proper operation of all hardware items.
  - 1. Door Opening Force: In accordance with the Americans with Disabilities Act (ADA), adjust all door hardware so that the maximum force required for pushing or pulling open a door shall be as follows:
    - a. Fire doors shall have a minimum opening force allowable by the appropriate administrative authority.
    - b. Exterior hinged doors: 8.5 lbf.
    - c. Interior hinged doors: 5.0 lbf.
    - d. Sliding or folding doors: 5.0 lbf.
  - 2. Door Closers: If door is equipped with a closer, then the sweep period of the closer shall be adjusted so that from an open position to 70 degrees, the door will take at least 3 seconds to a point 3 inches from the latch, measured to the leading edge of the door.
  - 3. The installer shall check the door closer adjustment after testing and balancing of the HVAC system and make any corrections as required. In addition, the door closers are to be checked six months after the final completion and adjusted as necessary.

**3.02 FIELD QUALITY CONTROL**

- A. Independent Architectural Hardware Consultant: Owner may engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

**3.03 DOOR HARDWARE SETS**

- A. The following is a general listing of the minimum hardware requirements. Any item of hardware normally required by good practice, or as to meet State and Local codes, shall be furnished even though it may not be specifically mentioned.

HW-1, Each pair to have:

LOCKSET	Corbin Russwin	CL3561 PZD 626
HINGE	Hagar	26D BB 1279 4.5 x 4.5
FLUSH BOLT	Hagar	26D 282D-12
CLOSER	Corbin Russwin	689 DC6210
KICKPLATE	Rockwood	K1050 US32D
GASKETING	National Guard	5050B
SWEEP	National Guard	200NA
THRESHOLD	National Guard	425 HD
DRIP STRIP	National Guard	16A
SILENCER	Rockwood	608
FLOOR STOP	Hagar	252F

HW-2, Each to have:

LOCKSET	Corbin Russwin	CL3561 PZD 626
HINGE	Hagar	26D BB 1279 4.5 x 4.5
CLOSER	Corbin Russwin	689 DC6210
KICKPLATE	Rockwood	K1050 US32D
GASKETING	National Guard	5050B
SWEEP	National Guard	200NA
THRESHOLD	National Guard	425 HD
DRIP STRIP	National Guard	16A
SILENCER	Rockwood	608
FLOOR STOP	Hagar	252F

HW-3, Each to have:

LOCKSET	Corbin Russwin	CL3561 PZD 626
HINGE	Hagar	26D BB 1279 4.5 x 4.5
CLOSER	Corbin Russwin	689 DC6210

CREMATORIUM ADDITION  
For Animal Village, City of Little Rock, Arkansas

CoLR Bid# 15128  
(AE#2014-205-10)

KICKPLATE	Rockwood	K1050 US32D
SWEEP	National Guard	200NA
THRESHOLD	National Guard	425 HD
DRIP STRIP	National Guard	16A
SILENCER	Rockwood	608
FLOOR STOP	Hagar	252F
HW-4, Each to have:		
LOCKSET	Corbin Russwin	CL3561 PZD 626
HINGE	Hagar	26D BB 1279 4.5 x 4.5
CLOSER	Corbin Russwin	689 DC6210
KICKPLATE	Rockwood	K1050 US32D
WALL STOP	Hagar	236W

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 09 21 16**  
**GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing for shaft wall assemblies.
- C. Acoustic and thermal insulation.
- D. Gypsum sheathing.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.
- G. Textured finish system.

**1.03 RELATED REQUIREMENTS**

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 10 00 - Rough Carpentry: Wood framing and blocking.
- C. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

**1.04 SUBMITTALS**

- A. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- C. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

**1.05 QUALITY ASSURANCE**

- A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.

**PART 2 PRODUCTS**

**2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

**2.02 METAL FRAMING MATERIALS**

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
  - 1. Clarkwestern Dietrich Building Systems LLC: [www.clarkdietrich.com](http://www.clarkdietrich.com).
  - 2. Marino: [www.marinoware.com](http://www.marinoware.com).
  - 3. Phillips Manufacturing Company: [www.phillipsmfg.com](http://www.phillipsmfg.com).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Metal Framing Connectors and Accessories:
  - 1. Same manufacturer as framing.
  - 2. Dietrich Metal Framing: [www.dietrichindustries.com](http://www.dietrichindustries.com).
  - 3. The Steel Network Inc: [www.SteelNetwork.com](http://www.SteelNetwork.com).
  - 4. Substitutions: See Section 016000 - Product Requirements.

**2.03 BOARD MATERIALS**

- A. Manufacturers - Gypsum-Based Board:
  - 1. CertainTeed Gypsum (BPB America Inc): [www.bpb-na.com](http://www.bpb-na.com).
  - 2. Georgia-Pacific Gypsum: [www.gpgypsum.com](http://www.gpgypsum.com).
  - 3. National Gypsum Company: [www.nationalgypsum.com](http://www.nationalgypsum.com).

4. Temple-Inland Inc: [www.templeinland.com](http://www.templeinland.com).
  5. USG Corporation: [www.usg.com](http://www.usg.com).
  6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wallboard: Gypsum wallboard as defined in ASTM C 1396/C 1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  2. Glass-mat-faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
  3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
  4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold-resistant board is required at all locations.
  5. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  6. Thickness:
    - a. Vertical Surfaces: 5/8 inch.
    - b. Ceilings: 5/8 inch.
    - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
- C. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
  4. Core Type: Regular.
  5. Regular Board Thickness: 1/2 inch.
  6. Edges: Square, for vertical or horizontal application.
  7. Glass Mat Faced Products:
    - a. CertainTeed Corporation; GlasRoc Brand.
    - b. Georgia-Pacific Gypsum; DensGlass Sheathing.
    - c. National Gypsum Company; Gold Bond Brand eXP Extended Exposure Sheathing.
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.
1. Glass Mat Faced Type: Glass mat shaftliner gypsum panel or glass mat coreboard gypsum panel as defined in ASTM C1658/C1658M.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. Products:
    - a. Georgia-Pacific Gypsum; DensGlass Shaftliner (mold-resistant).
    - b. National Gypsum Company; Gold Bond Brand eXP Shaftliner.
    - c. Substitutions: See Section 01 60 00 - Product Requirements.

#### **2.04 ACCESSORIES**

- A. Acoustic and Thermal Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced.
- B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
  1. Provide acoustical liner pads, for use in conjunction with electrical back boxes.
- C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
  1. Types: As detailed or required for finished appearance.
  2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.
  3. Manufacturers - Finishing Accessories:
    - a. Same manufacturer as framing materials.
    - b. Phillips Manufacturing Co: [www.phillipsmfg.com](http://www.phillipsmfg.com).

- c. Substitutions: See Section 016000 - Product Requirements.
- D. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
  - 1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
  - 2. Ready-mixed vinyl-based joint compound.
  - 3. Chemical hardening type compound.
- E. Textured Finish Materials: Latex- or Vinyl-based compound; plain.
- F. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated for exterior locations.
- G. Screws for Attachment to Steel Members From 0.033 to 0.112 Inch in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.
- H. Screws: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.
- I. Screws: ASTM C 954; steel drill screws for application of gypsum board to loadbearing steel studs.
- J. Nails for Attachment to Wood Members: ASTM C514.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

#### **3.02 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Studs: Space studs as indicated.
  - 1. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

#### **3.03 BOARD INSTALLATION**

- A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.
- C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Exterior Sheathing: Comply with ASTM C1280. Install sheathing horizontally, with edges butted tight and ends occurring over firm bearing.
  - 1. Seal joints, cut edges, and holes with water-resistant sealant.
- E. Installation on Metal Framing: Use screws for attachment of all gypsum board.

#### **3.04 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
  - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
  - 2. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

### **3.05 JOINT TREATMENT**

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C 840 and as scheduled below.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
  - 2. Taping, filling and sanding is not required at base layer of double layer applications.
- E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

### **3.06 TEXTURE FINISH**

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions.
- B. Texture Required: Orange peel, as approved.

### **3.07 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

### **3.08 FINISH LEVEL SCHEDULE**

- A. Level 1: Above finished ceilings concealed from view.
- B. Level 4: Walls and ceilings scheduled to receive paint finish.

**END OF SECTION**

**SECTION 09 51 00**  
**ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

**1.04 SUBMITTALS**

- A. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, mechanical and electrical items installed in the ceiling,, and for ceiling areas 144 square feet and larger seismic details to resist seismic design loads and category, including grid type, perimeter channels, hanger spacing, and cross bracing.
- B. Product Data: Provide data on suspension system components.

**1.05 QUALITY ASSURANCE**

- A. Seismic Requirements: Complete assembly shall comply with the International Building Code.
  - 1. Seismic Design Criteria: As required by Code and as indicated (structural Sheet S-001).
  - 2. Seismic Design Category: C, importance factor 1.0.
  - 3. Contractor is responsible for obtaining approval of the authority having jurisdiction for manufacturer's alternative components and methods.

**1.06 FIELD CONDITIONS**

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

**PART 2 PRODUCTS**

**2.01 BASIS OF DESIGN:**

- A. Products indicated in the color and finish schedules or drawing notes; including color, shade, hue, translucence, opacity, pattern, or texture; establish the Basis of Design. Use the Basis of Design.
- B. Substitutions: Not permitted.

**2.02 ACOUSTICAL UNITS**

- A. Acoustical Units - General: ASTM E1264, Class A.
- B. ACT-1 Acoustical Panels, unless otherwise indicated, Cortega Square Edge, Item #770, by Armstrong: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
  - 1. VOC Content: Certified as Low Emission by one of the following :
    - a. GreenGuard Children and Schools; [www.greenguard.org](http://www.greenguard.org).
    - b. Product listing in the CHPS Low-Emitting Materials Product List at; [www.chps.net/manual/lem\\_table.htm](http://www.chps.net/manual/lem_table.htm).
  - 2. Size: 24 x 24 inches.
  - 3. Light Reflectance: 0.82 percent, determined as specified in ASTM E1264.
  - 4. NRC: 0.55, determined as specified in ASTM E1264.
  - 5. Ceiling Attenuation Class (CAC): 40, determined as specified in ASTM E1264.

6. Edge: Square.
7. Surface Color: White.

C. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.03 SUSPENSION SYSTEM(S)**

- A. Manufacturers:
  1. Armstrong World Industries, Inc: [www.armstrong.com](http://www.armstrong.com).
  2. Chicago Metallic Corporation: [www.chicagometallic.com](http://www.chicagometallic.com).
  3. Or same as for acoustical units.
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems - General: ASTM C635; die cut and interlocking components, with stabilizer bars, clips, splices, and perimeter moldings as required.
- C. Exposed Steel Suspension System: Formed hot-dipped galvanized steel, commercial quality cold rolled; heavy-duty.
  1. Profile: Tee; 15/16 inch wide face.
  2. Construction: Double web.

### **2.04 ACCESSORIES**

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
  1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
  2. Width of molding shall comply with seismic requirements.
- C. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
- D. Gasket For Perimeter Moldings: Closed cell rubber sponge tape.
- E. Extruded aluminum trim provides crisp edge detailing and excellent corrosion resistance compared to steel systems. Compatible with Armstrong exposed tee suspension systems and Drywall Grid Systems

## **PART 3 EXECUTION**

### **3.01 INSTALLATION - SUSPENSION SYSTEM**

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system according to reflected plan.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Install with acoustical sealant or continuous gasket.
2. Use longest practical lengths.
3. Overlap and rivet corners.

**3.02 INSTALLATION - ACOUSTICAL UNITS**

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
  1. Make field cut edges of same profile as factory edges.
- G. Where round obstructions occur, provide preformed closures to match perimeter molding.
- H. Install hold-down clips on panels within 20 ft of an exterior door.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 09 65 00**  
**RESILIENT FLOORING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Resilient sheet flooring.
- B. Resilient tile flooring.
- C. Resilient base.
- D. Installation accessories.

**1.02 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions. Include adhesives and manufacturers recommendations and substrate and field conditions limitations.
- C. Shop Drawings: Indicate seaming plan.
- D. Verification Samples: Submit two samples, illustrating color and pattern for each resilient flooring product specified.
- E. Concrete Testing Standard: Submit a copy of ASTM F710.
- F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

**1.03 QUALITY ASSURANCE**

- A. Where floor covering goes over new concrete perform moisture tests in accordance with ASTM F710. Where new concrete slab (patches) exceeds manufacturer recommendations use sealer and/or special adhesive as recommended by floorig manufacturer.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Protect roll materials from damage by storing on end.

**1.05 FIELD CONDITIONS**

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

**PART 2 PRODUCTS**

**2.01 SHEET FLOORING**

- A. Vinyl Sheet Flooring SV: Homogeneous without backing, with color and pattern throughout full thickness, and:
  - 1. Minimum Requirements: Comply with ASTM F1913.
  - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
  - 3. Total Thickness and Wear Layer Thickness: 0.080 inch nominal.
  - 4. Sheet Width: 72 inch minimum.
  - 5. Static Load Resistance: 250 psi minimum, when tested as specified in ASTM F970.
  - 6. Heat welded seams.
  - 7. Pattern and Color: As indicated on Color and Finish Schedule.
  - 8. Manufacturers:
    - a. Basis of Design: Armstrong Medintech.; [www.armstrong.com](http://www.armstrong.com).

- b. Other Acceptable Manufacturers:
  - 1) Polyflor, Ltd.; [www.polyflor.com](http://www.polyflor.com)
  - 2) Mipolam Elegance 290 (Compact) as manufactured by Gerflor.
  - 3) Optima Series as manufactured by Johnsonite.
- 9. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Vinyl Welding Rod: Solid vinyl bead produced by manufacturer of vinyl flooring for heat welding seams, in color matching field color.

## 2.02 TILE FLOORING

- A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness, and:
  - 1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
  - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
  - 3. Size: 12 x 12 inch.
  - 4. VOC Content: As specified in Section 01 61 16.
  - 5. Thickness: 0.125 inch.
  - 6. Manufacturers:
    - a. Armstrong World Industries, Inc: [www.armstrong.com](http://www.armstrong.com).
    - b. Mannington Mills, Inc: [www.mannington.com](http://www.mannington.com).
    - c. Johnsonite, a Tarkett Company: [www.johnsonite.com](http://www.johnsonite.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.03 BASE

- A. Resilient Base: ASTM F1861, Type TP or TV; top set Style B, Cove, and as follows:
  - 1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
  - 2. Height: 4 inch, where indicated.
  - 3. Thickness: 0.125 inch thick.
  - 4. Finish: Satin.
  - 5. Color: Match existing.
  - 6. Accessories: Premolded external corners and end stops.
  - 7. Manufacturers:
    - a. Burke Flooring: [www.burkemercer.com](http://www.burkemercer.com).
    - b. Johnsonite, a Tarkett Company: [www.johnsonite.com](http://www.johnsonite.com).
    - c. Roppe Corp: [www.roppe.com](http://www.roppe.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.04 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer for conditions encountered.
- C. Where new concrete slab (patches) exceeds manufacturer recommendations use sealer and/or special adhesive for high relative humidity as recommended by floorig manufacturer.
- D. Moldings, Transition and Edge Strips: As recommended by manufacturer.

## 2.05 ALTERNATE ADHESIVE

- A. In the event moisture testing indicated that a special adhesive is required to meet high relative humidity provide adhesive as recommended by flooring manufacturer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

- B. Verify that floor surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
  - 1. Test in accordance with ASTM F710.
  - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

### **3.02 PREPARATION**

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- C. Sub-floor defect that telegraph through flooring are not acceptable and flooring will be rejected.
- D. Prohibit traffic until filler is cured.
- E. Vacuum clean substrate.
- F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

### **3.03 INSTALLATION**

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Spread adhesive and back roll. Installations with trowel marks that telegraph through flooring are not acceptable and flooring will be rejected.
- E. Fit joints tightly.
- F. Set flooring in place, press with heavy roller to attain full adhesion.
- G. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- H. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

### **3.04 SHEET FLOORING**

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns carefully at seams.
- B. Double cut sheet at seams.
- C. Lay flooring with tightly butted seams, without any seam sealer unless otherwise indicated.
- D. Finish seams in sheet vinyl by heat welding.
- E. Double cut sheet; provide heat welded seams.
- F. Coved Base: Install using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

### **3.05 TILE FLOORING**

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

**3.06 RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.

**3.07 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions.

**3.08 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION**

**SECTION 09 90 00**  
**PAINTING AND COATING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. Do Not Paint or Finish the Following Items:
  - 1. PVC coated chainlink fabric.
  - 2. Galvanized finished posts, bars, hardware, accessories for chainlink fencing (kennels).
  - 3. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
  - 4. Items indicated to receive other finishes.
  - 5. Items indicated to remain unfinished.
  - 6. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
  - 7. Non-metallic roofing and flashing.
  - 8. Stainless steel, anodized aluminum, bronze, terne, and lead items.
  - 9. Floors, unless specifically so indicated.
  - 10. Concealed pipes, ducts, and conduits.

**1.02 GLOSS / SHEEN STANDARDS AND DEFINITIONS**

- A. Gloss Level 1: Matte or Flat Finish - Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: Eggshell Finish - 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: Satin Finish - 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: Semi-Gloss Finish - 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: Gloss Finish - 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
  - 2. MPI product number (e.g. MPI #47).
  - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
  - 4. Manufacturer's installation instructions.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
  - 1. Where sheen is specified, submit samples in only that sheen.
  - 2. Where sheen is not specified, discuss sheen options with Architect Engineer before preparing samples, to eliminate sheens definitely not required.
  - 3. Allow 30 days for approval process, after receipt of complete samples by Architect Engineer.
  - 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as siding, have been approved.
- D. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.

- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data on color, cleaning, touch-up, and repair of painted and coated surfaces.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.
- C. Material Safety Data Sheets: At project site maintain file of MSDS sheets for each product used; become familiar with and follow manufacturer's stated application and safety requirements.

#### **1.05 MOCK-UP**

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, 6 feet long by 9 feet wide, illustrating paint coating color, texture, and finish.
- C. Provide door and frame assembly illustrating paint coating color, texture, and finish.
- D. Locate where directed.
- E. Approved mock-up may remain as part of the work.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

#### **1.07 FIELD CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Paints (Standard Paints): Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin Moore & Co: [www.benjaminmoore.com](http://www.benjaminmoore.com).
  - 2. PPG Architectural Finishes, Inc: [www.ppgaf.com](http://www.ppgaf.com).
  - 3. Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com).
  - 4. Farrell-Calhoun: [www.farrellcalhoun.com](http://www.farrellcalhoun.com).
- C. Manufacturers (Specialty Paints): Subject to compliance with requirements, provide products by one of the following:
  - 1. Master Builders Solutions, MasterProtect HB 400 (Thorocoat) as manufactured by BASF Building Systems; [www.master-builders-solutions.basf.us/en-us](http://www.master-builders-solutions.basf.us/en-us).
  - 2. Sherwin Williams; [www.sherwin-williams.com](http://www.sherwin-williams.com).
  - 3. PPG; [www.ppg.com](http://www.ppg.com).

- 4. Substitutions: See Section 016000 - Product Requirements.
- D. Block Fillers: As recommended by manufacturer of top coats.
- E. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.02 PAINTS AND COATINGS - GENERAL**

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
  - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 3. Supply each coating material in quantity required to complete entire project's work from a single production run.
  - 4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Primer as required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
  - 1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Architectural coatings VOC limits of the State of Arkansas.
  - 2. Use adhesives, sealants, paints, and coatings, that comply with the specified limits for VOC content when calculated according to SCAQMD Rule #1168. Minimum of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
    - a. Flat Paints and Coatings: 50 g/L.
    - b. Nonflat Paints and Coatings: 150 g/L.
    - c. Dry-Fog Coatings: 400 g/L.
    - d. Primers, Sealers, and Undercoaters: 200 g/L.
    - e. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
    - f. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
    - g. Pretreatment Wash Primers: 420 g/L.
    - h. Floor Coatings: 100 g/L.
    - i. Shellacs, Clear: 730 g/L.
    - j. Shellacs, Pigmented: 550 g/L.
  - 3. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
  - 4. Patching Material: Latex filler.
  - 5. Fastener Head Cover Material: Latex filler.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect Engineer from the manufacturer's full line.
- E. Colors: As indicated on drawings

## **2.03 PAINT SYSTEMS - GENERAL**

- A. Provide Premium Grade systems (2 top coats) , except as otherwise indicated.
- B. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.

- C. Provide colors as scheduled on Drawings, Color and Finish Schedules, or as selected by Architect Engineer.

#### **2.04 PAINT SYSTEMS - EXTERIOR**

- A. General: Exterior Masonry Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including cement board.
1. Preparation as specified by manufacturer.
  2. Two top coats and one coat primer recommended by manufacturer.
  3. Top Coat(s): Exterior High Build Latex; MPI #40.
- B. Cementitious Siding or Wood, Opaque, Latex, 3 Coat:
1. One coat of latex primer sealer as recommended by manufacturer of topcoat.
  2. Semi-gloss: Two coats of latex enamel.
- C. Ferrous Metals, Primed, Latex:
1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
  2. Quick Dry Enamel: Q.D. Primer MPI #76, Q.D. Enamel MPI #81 or 96, Semi-gloss.
  3. Approved Products:
    - a. PPG:
      - 1) Primer: MPI #76 PPG 94-258 Multiprime Fast Dry 2.8 VOC Universal Primer.
      - 2) Two Coats: MPI #81 - PPG 7-844 Series Int. Industrial Semi-Gloss Oil.
    - b. PPG (Green):
      - 1) Primer: MPI #107 Approved Primer: 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer.
      - 2) Two coats: MPI #153 Approved Finish: 90-1210 Series Pitt Tech Plus Int/Ext SG DTM Ind. Enamel.
    - c. Farrell-Calhoun
      - 1) Primer: Farrell-Calhoun #1024/1069 Tuff-Boy Quick Dry Rust-Stop Primers.
      - 2) Two Coats: Farrell-Calhoun #800 Line Tuff-Boy Interior/Exterior Industrial Gloss Enamel.
    - d. Sherwin Williams
      - 1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310.
      - 2) Two Coats: DTM Acrylic Semi Gloss Coating B66W211.
    - e. Benjamin Moore
      - 1) Primer: Corotech V131 Universal Metal Primer.
      - 2) Two Coats: BM P24 D.T.M. Alkyd Semi-gloss (or) 96 Corotech V230. Alkyd Quik Dry Enamel or V220 Rapid Dry Enamel.
- D. Galvanized Metals, Not Chromate Passivated:
1. Latex: Cementitious Primer MPI #26, Latex MPI #11, semi-gloss.
  2. Approved Products:
    - a. PPG (Green):
      - 1) Primer: 90-912 Pitt Tech Plus Int/Ext DTM Acrylic Primer; MPI #11 Approved.
      - 2) Two coats: 6-610XI Series Speedhide 100% Acrylic Exterior. Semi-Gloss Finish.
    - b. Sherwin Williams
      - 1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310.
      - 2) Two Coats: DTM Acrylic Semi Gloss Coating B66W211 Finish.
    - c. Benjamin Moore
      - 1) Primer as recommended by manufacturer.
      - 2) Two Coats: Benjamin Moore N449 Ultra Spec EXT Finish.
    - d. Farrell-Calhoun (Green):
      - 1) Primer: Farrell-Calhoun #5-56 100% Acrylic All Purpose Metal Primer.
      - 2) Two Coats: Farrell-Calhoun #2400 Line 100% Acrylic Exterior Gloss Enamel Finish.



## 2.05 PAINT SYSTEMS - INTERIOR

- A. General: All Interior Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry, wood, uncoated steel, shop primed steel, galvanized steel, and aluminum.
1. Two top coats and one coat primer.
  2. Primer(s): As recommended by manufacturer of top coats.
- B. Structural Steel and Metal Fabrications:
1. Quick Dry Enamel: Q.D. Primer MPI #95, Q.D. Enamel MPI #81, semi-gloss.
  2. Approved Products:
    - a. PPG:
      - 1) Primer: MPI #95 Approved Primer: 6-204 Speedhide Int/Ext Zinc Chromate Metal Primer;
      - 2) Two coats: MPI #81 Approved Finish: 7-844 Series Int. Industrial Semi-Gloss Oil
    - b. PPG (Green):
      - 1) Primer: MPI #107 Approved Primer: 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer;
      - 2) Two coats: MPI #153 Approved Finish: 90-1210 Series Pitt Tech Plus Int/Ext SG DTM Ind. Enamel.
    - c. Sherwin Williams
      - 1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310
      - 2) Two Coats: Promar 200 Alkyd Semi Gloss B34W251
    - d. Sherwin Williams (Interior Exposed Structural Steel Ceilings, Ceiling Decks, Ductwork)
      - 1) Primer: As recommended by manufacturer.
      - 2) Two Coats: Water Based Acrylic Dryfall Flat White/ Egshel White, Flat Black B42W1/2/BW3
    - e. Sherwin Williams (Green):
      - 1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310
      - 2) Two Coats: Pro Industrial 0 Voc Acrylic Semi Gloss Coating B66W651
    - f. Benjamin Moore
      - 1) Primer: Benjamin Moore P04 Super Spec HP Acrylic Metal Primer.
      - 2) Two Coats: Benjamin Moore P24 D.T.M. Alkyd Semi-gloss
    - g. Farrell-Calhoun
      - 1) Primer: #1024/1069 Tuff-Boy Quick Dry Rust-Stop Primers;
      - 2) Two Coats: Farrell-Calhoun #800 Line Tuff-Boy Interior/Exterior Industrial Gloss Enamel
    - h. Farrell-Calhoun (Green):
      - 1) Primer: #5-56 100% Acrylic All Purpose Metal Primer;
      - 2) Two Coats: Farrell-Calhoun #8000 Line Tuff-Boy Waterborne 100% Acrylic DTM Enamel.
- C. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and Galvanized Metal, Not Chromate Passivated:
1. Two top coats and one coat primer.
  2. Latex: W.B. Primer MPI #134, Latex MPI #54, gloss level 5.
  3. Approved Products:
    - a. PPG:
      - 1) Primer: MPI #134 Approved Primer 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer;
      - 2) Two Coats: MPI #54 Gloss Level 5 Approved Finish: 6-4510 Series Speedhide Zero Int. Latex SG
    - b. Sherwin Williams (Green):
      - 1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310
      - 2) Two Coats: Pro Industrial 0 Voc Acrylic Semi Gloss Coating B66W651

- c. Benjamin Moore
    - 1) Primer: Benjamin Moore P04 Super Spec HP Acrylic Metal Primer or BM P25 Super Spec D.T.M. Acrylic Low Lustre.
    - 2) Two Coats: Benjamin Moore N540 Ultra Spec 500 gloss.
  - d. Farrell-Calhoun (Green):
    - 1) Primer: Farrell-Calhoun #5-56 100% Acrylic All Purpose Metal Primer
    - 2) Two Coats: Farrell-Calhoun #600 Line 100% Acrylic Interior Semi-Gloss Latex Enamel
- D. Transparent Finish on Wood, Unless Otherwise Indicated:
- 1. Stain: MPI Semi-Transparent Stain for Wood; MPI #90.
  - 2. Top Coat(s): MPI Polyurethane Varnish, Oil Modified; MPI #56, 57.
  - 3. Approved Products:
    - a. Sherwin Williams Interior Wood Stained; Match existing.
      - 1) 1st Coat: Sherwood Bac Wiping Stain S64N51.
      - 2) 2nd Coat: Wood Classic Fast Dry Oil Sanding Sealer B26V43.
      - 3) 3rd Coat: Wood Classic Fast Dry Satin Varnish A66F390.
    - b. Sherwin Williams (Green) Interior Wood Stained
      - 1) 1st Coat: Sherwood Water Reducible Wiping Stain S64 Series.
      - 2) 2nd Coat: Kem Aqua Water Reducible Sealer T65F520..
      - 3) 3rd Coat: Kem Aqua Water Reducible Finish T75F528.
- E. Gypsum Board, Latex-Acrylic:
- 1. Latex: Latex Primer Sealer MPI #50, Latex #52, gloss level 3.
  - 2. Approved Products:
    - a. PPG:
      - 1) Primer: MPI #50 Approved Primer 6-4900 Speedhide Zero Int. Latex Sealer;
      - 2) Two coats: MPI #52 Gloss Level 3 Approved Finish: 6-3511 Series. Speedhide Int. Satin Acrylic Latex.
    - b. Sherwin Williams .
      - 1) Primer: Preprite Hi Build Primer B28W8601
      - 2) Two Coats: Promar 200 Latex Flat/Egshel/Semi Gloss B30/20/31W2251.
    - c. Sherwin Williams (Green).
      - 1) Primer: Promar 200 0 Voc Latex Primer B28W2600.
      - 2) Two Coats: Promar 200 0 Voc Latex Flat/Egshel/Semi Gloss B30/20/31W2651.
    - d. Benjamin Moore
      - 1) Primer: Benjamin Moore N534 Ultra Spec 500 Latex Primer.
      - 2) Two Coats: Benjamin Moore N538 Ultra Spec 500.
    - e. Farrell-Calhoun (Green)
      - 1) Primer: Farrell-Calhoun #380 Perfik-Seal Interior Latex Primer/Sealer.
      - 2) Two Coats: Farrell-Calhoun #670 Line Interior Latex Satin Enamel.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect Engineer of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Gypsum Wallboard: 12 percent.

2. Cementitious Siding, Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

### 3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
  - 1. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before preparation and finishing.
  - 2. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Asphalt, Creosote, or Bituminous Surfaces to be Painted: Remove foreign particles to permit adhesion of finishing materials. Apply latex based sealer or primer.
- I. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- J. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- K. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- L. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- M. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- N. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- O. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- P. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied. Back prime concealed surfaces before installation.

### 3.03 APPLICATION

- A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- B. Apply products in accordance with manufacturer's instructions.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- K. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.
  - 1. Brush Application: Use brushes best suited for the type of material applied; use brush of appropriate size for the surface or item being painted; produce results free of visible brush marks.
  - 2. Roller Application: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
  - 3. Spray Application: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
  - 4. Where application method is listed in the MPI Manual for the paint system that application method is required; otherwise any application method recommended by manufacturer for material used and objects to be painted is acceptable.
- L. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.
  - 1. Number of coats and film thickness required are the same regardless of application method.
  - 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
  - 3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
- M. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
  - 1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
  - 2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
  - 3. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
  - 4. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to lift or lose adhesion.

5. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
6. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

**3.04 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

**3.05 PROTECTION**

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 10 44 00**  
**FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

**1.02 REFERENCE STANDARDS**

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions.
- C. Product Data: Provide color and finish and anchorage details.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Fire Extinguishers:
  - 1. Amerex: [www.amerex-fire.com](http://www.amerex-fire.com).
  - 2. Ansul, a Tyco Business: [www.ansul.com](http://www.ansul.com).
  - 3. Nystrom, Inc: [www.nystrom.com](http://www.nystrom.com).
  - 4. Pyro-Chem, a Tyco Business: [www.pyrochem.com](http://www.pyrochem.com).
  - 5. JL Industries, Inc: [www.jlindustries.com](http://www.jlindustries.com).
  - 6. Larsen's Manufacturing Co: [www.larsensmfg.com](http://www.larsensmfg.com).
  - 7. Potter-Roemer: [www.potterroemer.com](http://www.potterroemer.com).
  - 8. Substitutions: Not permitted.
- B. Fire Extinguisher Cabinets and Accessories:
  - 1. Ansul, a Tyco Business: [www.ansul.com](http://www.ansul.com).
  - 2. JL Industries, Inc: [www.jlindustries.com](http://www.jlindustries.com).
  - 3. Larsen's Manufacturing Co: [www.larsensmfg.com](http://www.larsensmfg.com).
  - 4. Potter-Roemer: [www.potterroemer.com](http://www.potterroemer.com).
  - 5. Pyro-Chem, a Tyco Business: [www.pyrochem.com](http://www.pyrochem.com).
  - 6. Substitutions: See Section 01 60 00 - Product Requirements.

**2.02 FIRE EXTINGUISHERS**

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
  - 1. Provide extinguishers labeled by UL for the purpose specified and indicated.
  - 2. Provide Bi-lingual labels.

- B. Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
  - 1. UL-rated 4-A:60-B:C, 10-lb nominal capacity.
  - 2. Class: A:B:C.
  - 3. Size: 10 pound capacity.
  - 4. Finish: Baked polyester powder coat, color as selected.
  - 5. Temperature range: -40 degrees F to 120 degrees F.

### **2.03 FIRE EXTINGUISHER CABINETS**

- A. Provide fire rated cabinets where installed in fire rated partitions.
- B. Metal: Formed primed steel sheet; 0.036 inch thick base metal.
- C. Cabinet Configuration: Semi-recessed type.
  - 1. Sized to accommodate extinguisher and accessories.
  - 2. Trim: Returned to wall surface, with ADA maximum 4 inch projection, 1-1/2 inch wide face.
- D. Door: 0.036 inch thick, reinforced for flatness and rigidity; recessed latch, unless otherwise indicated. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon catch.
- E. Door Glazing: Glass, clear, 1/8 inch thick tempered. Set in resilient channel gasket glazing.
  - 1. Vertical Duo type with glazing, unless otherwise indicated.
- F. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- G. Weld, fill, and grind components smooth.
- H. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish.
- I. Finish of Cabinet Interior: White enamel.

### **2.04 ACCESSORIES**

- A. Cabinet Signage: As required by AHJ.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, mounting height as required by Authorities Having Jurisdiction for ADA Accessibility Guidelines from finished floor to the carrying handle.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets, unless otherwise indicated.

**END OF SECTION**



**SECTION 11 80 00**  
**OTHER EQUIPMENT**

**PART 1 GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SECTION INCLUDES**

- A. Walk-In Freezer
- B. Incinerator

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's product data and installation instructions.
- C. Shop Drawings: Indicate location of equipment and utilities. Indicate clearances for accessibility to perform required maintenance.
- D. Operation Data and Maintenance Data: Submit manufacturer's operation and maintenance data, including listing of replacement parts. Provide two hard copies and two electronic copies.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**PART 2 PRODUCTS**

**2.01 WALK-IN FREEZER**

- A. Provide, complete including utility hook up, functional and ready for Owner's use the freezer identified on the drawings (Sheet A-101), or approved equal.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

**2.02 INCINERATOR**

- A. Provide, complete including utility hook up, functional and ready for Owner's use the incinerator identified on the drawings (Sheet A-101), or approved equal.
- B. Contractor is responsible for obtaining installation and operational permits, including but not necessarily limited to ADEQ. Coordinate the testing and paperwork, submitting copies for Owner's records.
- C. Substitutions: Not permitted.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Comply with manufacturer's installation instructions.

**3.02 TRAINING AND MAINTENANCE**

- A. Provide Owner's personnel a minimum of 8 hours training for operating and maintenance of each type of equipment.

**3.03 ADJUSTMENT**

- A. Adjust moving parts for proper operation.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 22 05 10**  
**BASIC PLUMBING REQUIREMENTS**

**PART 1 GENERAL**

**1.01 PROJECT MANAGEMENT**

- A. Drawings are diagrammatic, all offsets, fitting, valves and accessories are not shown. Refer to all drawings in the contract documents and plan work accordingly. Coordinate with all trades and crafts.
- B. In case of interference between trades, Architect Engineer will decide which work is to take precedence regardless of work that might be installed.

**1.02 CODES, ORDINANCES, INSPECTIONS, AND PERMITS**

- A. Execute and inspect Work in accordance with local and state codes, laws, ordinances, rules and regulations applicable to particular class of Work.
- B. Should any part of Drawings or specifications be found to be in conflict with applicable codes or ordinances, notify the Architect Engineer, in writing, 72 hours prior to receiving of bids. After the receiving of bids, any discovery of code violations shall be promptly reported to the Architect Engineer. Any work performed knowingly in violation of codes shall be corrected without additional expense to the Owner or his representative.
- C. All plumbing work shall comply with latest local codes and the the State of Arkansas plumbing code.
- D. Arrange with County, City, or State, if City has no ordinances covering work, for complete inspection, paying all charges pertaining thereto. Give proper authority all requisite notice relating to work under such; afford Architect Engineer and all authorized inspectors every facility for inspection and be responsible for all violations of law. Upon completion of Work, have Work inspected, if required, obtaining certificate of inspection and approval from inspecting agency and deliver such certificate to Architect Engineer. Comply with Division 01.

**1.03 COORDINATION**

- A. Conduct multi-trade coordination and preinstallation meetings to establish bottom elevations of all piping, ductwork and conduit before fabrication and installation. Comply with Division 01.
- B. All equipment shall be installed in accordance with the manufacturer's recommendations. It is the contractor's responsibility to follow all installation requirements and guidelines provided in the manufacture's installation manual. If there is a conflict with regards to installation, the contractor shall stop work and notify the design Architect Engineer representative.

**1.04 SUBMITTALS**

- A. Comply with Division 01.
- B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for plumbing fixtures, plumbing specialties, plumbing equipment, and others as may be requested.
- C. Shop Drawings: Miscellaneous steel for pipe support, duct support, pipe guides, anchors, and miscellaneous steel used for supporting any mechanical equipment.

**1.05 SUBSTITUTIONS**

- A. Comply with Division 01.
- B. Any proposed substitutions of equipment shall be accompanied by shop drawings showing revised equipment layouts, piping diagrams, ductwork drawings and/or wiring diagrams. Where substituted equipment furnished requires use of larger, more, or differently arranged connections, such connections shall be installed to the complete satisfaction of Architect Engineer without additional cost to Owner.
- C. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the Contractor shall replace this material or equipment with that as originally specified, or corrected as directed by Architect Engineer.

**1.06 CLEAN UP**

- A. Comply with Division 01.
- B. Do not allow waste material or rubbish to accumulate in or about job site.
- C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep clean mechanical systems shall be repaired without cost to Owner.

**1.07 EQUIPMENT START-UP AND SYSTEM COORDINATION**

- A. Comply with Division 01.
- B. The Contractor shall be responsible for placing all equipment and system components into operation. Individual components shall be coordinated with other parts of Mechanical, Electrical, Plumbing and/or Fire Protection Systems to ensure that the entire project functions as designed and described by the contract documents.

**1.08 CUTTING AND PATCHING**

- A. Comply with Section 01 17 00 - Execution and Closeout Requirements.
- B. Provide all cutting and patching required to perform the mechanical work, when alteration, repair, renovation, or addition, to existing construction.

**1.09 DEMOLITION**

- A. Comply with Section 02 41 00 - Demolition.
- B. Alterations and Minor Demolition: Comply with Section 01 17 00 - Execution and Closeout Requirements.

**1.10 RECORD DOCUMENTS**

- A. Comply with Division 01.

**1.11 OPERATION INSTRUCTIONS**

- A. Comply with Division 01.
- B. Printed instructions, installed in a suitable frame with a glass front, covering the operation and maintenance of each major item of equipment, shall be posted at locations designated by the Architect Engineer. Provide 2 bound manuals containing complete repair parts lists, and operating service and maintenance instructions for all equipment provided.

**1.12 INSTRUCTION**

- A. Comply with Section 01 79 00 - Demonstration and Training.

**1.13 FLASHINGS**

- A. Refer to Division 07 for roof flashings.

**1.14 ACCESS PANELS**

- A. Comply with Section 08 31 00 - Access Doors.
- B. Provide access panels as necessary for servicing of fire dampers, smoke dampers, valves, VAV terminals and any other equipment in concealed spaces.

**1.15 PAINT EXTERIOR PIPING**

- A. All exterior steel piping shall be painted using a metal primer coat, second coat of enamel, top coat of enamel and a finish coat of gloss.
- B. Natural gas piping shall be painted yellow.

**1.16 DOMESTIC WATER PIPING**

- A. Valve, strainer and other domestic water piping specialties shall be bronze, brass, stainless steel or epoxy coated cast iron only for the services that are in contact with domestic water.
- B. No cast iron valves, strainers or any other accessories that contact domestic water are allowed without epoxy coating.

### **1.17 LOCAL SITE CONDITIONS**

- A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Utility locations shown were obtained from surveys and/or local utility companies and are not to be assumed as being accurate.
- B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply as to condition of soil to be encountered.

### **1.18 GUARANTY-WARRANTY**

- A. This guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the true intent and purpose of these specifications. Conduct such tests as herein specified or as may be required by the Architect Engineer to demonstrate capacity and performance ability of various systems to maintain specified conditions.
- B. All materials and equipment shall be new and unused and shall carry a full year's warranty from time Owner accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections.

### **1.19 EQUIPMENT CONNECTIONS**

- A. Each equipment item with drain connections, shall be provided with a properly-sized drain run to the nearest floor drain or as directed.
- B. Rough-in and make final connection to all equipment requiring same, furnished under other Divisions of these specifications or by the Owner.
  - 1. Provide necessary labor and materials, including stop valves, traps, pressure-reducing valves, etc. necessary. Trap and vent drainage connections as required.
  - 2. If equipment or fixtures to be furnished by Owner and/or Owner's vendor are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.
- C. No equipment or fixture shall be "roughed-in" until proper rough-in drawings are in the hands of the trade doing the work.

### **1.20 ELECTRICAL**

- A. Furnish and install all electrical interlock, control and other wiring, not covered specifically under the electrical plans and specifications, for proper operation and control of all equipment specified under this Division of the specifications.
- B. Provide variable frequency drive controllers on all HVAC fan and pump motors that are three phase powered regardless if they serve a constant flow or variable flow system.
- C. Supervise and coordinate all electrical work in connection with mechanical system.

### **1.21 MOTOR CONTROLLERS**

- A. Furnish all motor controllers or contactors, not furnished as part of a motor control center, for proper operation of all motors.
- B. Where motor controllers or contactors are furnished as part of a motor control center, provide a schedule of every motor or equipment item furnished, its voltage requirements, type controller required, accessories required and interlocks. This schedule shall be submitted within 45 days of Notice to Proceed to Architect Engineer and supplier of motor control center for approval.
- C. Provide magnetic starters and with overload protection for single phase motors larger than 1/2 horsepower and all 3 phase motors. Starters for 3-phase motors shall have 3-pole overload protection. All starters shall have pilot lights. Starters being controlled by other devices shall have "hand"- "off"- "auto" switches. Starters being controlled locally shall have push button stations mounted on starter or remote. Provide auxiliary contacts as required. Provide manual starter with overload on all motors 1/2 HP or less that are not inherently protected, and if required for remote control, a magnetic contactor.

- D. All starters and switches shall be in a proper NEMA enclosure and shall be identified with engraved laminated plastic label.

**1.22 EXCAVATION, TRENCHING, AND BACKFILLING**

- A. All excavation, trenching and backfilling in connection with the mechanical system, to a point 5'0" outside the building, is included as part of this Division.
- B. All excavation required shall be done as part of the bid price regardless of any implied conditions on the plans or in these specifications.
- C. Excavation to have 12 inch minimum and 24 inch maximum clearance on all sides. Do not carry excavation below required level unless indicated otherwise on the drawings. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel or concrete, as directed by Architect Engineer and thoroughly compacted. Remove any unstable soil and replace with gravel, crushed stone or clean sand and thoroughly compact. Architect Engineer will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to excavations to prevent water running in. Remove, by pumping or other means any water accumulated in excavation.
- D. Banks of trenches shall be vertical or as shown on the drawings. Width of trench to be 5 inches minimum, 8 inches maximum on each side of pipe bell. Bottom of trench for sewers and culverts shall be rounded so that an arc of circumference equal to 0.6 of outside diameter or pipe rests on undisturbed soil wherever practicable. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8 inches below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.
- E. Bracing, sheathing and shoring shall be performed as necessary to complete and protect excavations indicated on the drawings, as required for safety, as directed by Architect Engineer, or to conform to governing laws.
- F. After piping, conduit, ducts, etc. have been installed, inspected, tested and approved by governing agency, backfill trenches with clean, stable soil free from stones. Place backfill in 4 inch layers, tamped under and around pipe and conduit to height of at least 2'0" above pipe. Tamping shall be done in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8 inch layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand. Compaction tests in accordance with Division 31 may be required by the Architect Engineer, with the costs paid by the Contractor.
- G. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless otherwise directed.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 22 05 53**

**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 2 PRODUCTS**

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 22 07 19**  
**PLUMBING PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Jackets and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 09 90 00 - Painting and Coating: Painting insulation jacket.
- C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

**1.03 REFERENCE STANDARDS**

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2013.
- B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- C. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2013.
- D. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 2010.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008.
- F. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.
- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2013.
- I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

**1.07 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

## **PART 2 PRODUCTS**

### **2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

### **2.02 GLASS FIBER**

- A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
  - 2. Maximum service temperature: 850 degrees F.
  - 3. Maximum moisture absorption: 0.2 percent by volume.
- B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
  - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
  - 2. Maximum service temperature: 650 degrees F.
  - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

### **2.03 JACKETS**

- A. PVC Plastic.
  - 1. Manufacturers:
    - a. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F.
    - b. Maximum Service Temperature: 150 degrees F.
    - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 10 mil.
    - e. Connections: Brush on welding adhesive.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  3. Insert location: Between support shield and piping and under the finish jacket.
  4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.
- J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 7 feet (2 meters) above finished floor): Finish with aluminum jacket.
- K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- L. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

### 3.03 SCHEDULES

- A. Plumbing Systems:
1. Domestic Hot Water Supply and Recirculation:
    - a. Glass Fiber Insulation:
      - 1) Pipe Size Range: 2 inch and smaller.
        - (a) Thickness: 1 inch.
      - 2) Pipe Size Range: Over [2] inch ([50] mm).
        - (a) Thickness: [1.5] inch ([40] mm).
  2. Domestic Cold Water:
    - a. Glass Fiber Insulation:
      - 1) Pipe Size Range: All Sizes
        - (a) Thickness: [1] inch ([25] mm).
- B. Other Systems:
1. Heat Maintenance Cable:
    - a. Per Manufacturer's instructions.
  2. Piping Exposed to Freezing with Heat Tracing:
    - a. Per Manufacturer's instructions.
  3. Handicap Fixture Traps, Stops and Supplies:
    - a. Manufactured Glass Fiber covering with PVC jacket. (Refer to Fixture Schedules).
  4. Provide aluminum jacket for all piping exposed to weather or damp locations.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 22 10 05**  
**PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Natural Gas.
  - 4. Condensate waste

**1.02 RELATED REQUIREMENTS**

- A. Section 22 0510 - Basic Plumbing Requirements
- B. Section 33 13 00 - Disinfecting of Water Utility Distribution.
- C. Section 07 84 00 - Firestopping.
- D. Section 09 90 00 - Painting and Coating.
- E. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- F. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- G. Section 22 07 19 - Plumbing Piping Insulation.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; The American Society of Mechanical Engineers; 2011.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2013.
- D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2011.
- E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2012.
- F. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2012 (ANSI/ASME B31.1).
- G. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2011 (ANSI/ASME B31.9).
- H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- I. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2013a.
- J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2013.
- L. ASTM B32 - Standard Specification for Solder Metal; 2008.
- M. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2010.
- N. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.
- O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
- P. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.

- Q. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2012.
- R. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Plastic Pipe, Schedules 40, 80, and 120; 2012.
- S. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.
- T. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- U. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2012.
- V. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- W. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
- X. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.
- Y. ASTM E84 - Standard Specification for "Standard Test Method for Surface Burning Characteristics of Building Materials" - (Flame Spread/Smoke Development).
- Z. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; 2010 (ANSI/AWWA C105/A21.5).
- AA. AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids; American Water Works Association; 2012.
- AB. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).
- AC. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2009.
- AD. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2011
- AE. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
- AF. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.
- AG. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.
- AH. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.
- AI. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- AJ. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
- AK. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.
- AL. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.
- AM. NSF 61 - Drinking Water System Components - Health Effects; 2012.
- AN. NSF 372 - Drinking Water System Components - Lead Content; 2011.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

#### **1.05 QUALITY ASSURANCE**

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME (BPV IX).
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### **1.07 FIELD CONDITIONS**

- A. Do not install underground piping when bedding is wet or frozen.

### **PART 2 PRODUCTS**

#### **2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### **2.02 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. Copper Tube: ASTM B306, DWV.
  - 1. Fittings: ASME B16.29, wrought copper, or ASME B16.32, solvent.
  - 2. Joints: ASTM B32, alloy Sn50 solder.
- C. PVC Pipe: ASTM D2729. (CAN NOT BE USED IN RETURN AIR PLENUMS)
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### **2.03 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Copper Pipe: ASTM B42, hard drawn, Type K.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: ASTM B 32, alloy Sn95 solder.

#### **2.04 WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
  - 3. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.

#### **2.05 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
  - 1. Fittings: ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: ASME B31.1, welded.
  - 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

#### **2.06 NATURAL GAS PIPING, ABOVE GRADE**

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
  - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: NFPA 54, threaded or welded to ASME B31.1.

#### **2.07 CONDENSATE WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. Copper Tube: ASTM B306, DWV.
  - 1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
  - 2. Joints: ASTM B32, alloy Sn50 solder.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### **2.08 CONDENSATE WASTE PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. Copper Tube: ASTM B306, DWV.
  - 1. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
  - 2. Joints: ASTM B32, alloy Sn50 solder.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

#### **2.09 FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 Inches and Under:
  - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
  - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
  - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
  - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
  - 1. Dimensions and Testing: In accordance with AWWA C606.



2. Housing Material: Malleable iron or ductile iron, galvanized.
  3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  4. When pipe is field grooved, provide coupling manufacturer's grooving tools.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## 2.10 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.
  5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
  6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
    - a. Bases: High density polypropylene.
    - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
    - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
    - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
    - e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  4. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
  4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  5. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
  6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  7. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
  8. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
  9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

### **2.11 GATE VALVES**

- A. Manufacturers:
  1. Conbraco Industries: [www.apollovalves.com](http://www.apollovalves.com).
  2. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  3. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Up To and Including 2 inch (50 mm).
  1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.
- C. 2-1/2 inches (50 mm) and larger:
  1. MSS SP-70, Class 125, iron body, with epoxy coated interior, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide gear-type operator on valves 4" and larger. Provide chain-gear operators for valves mounted over 8 feet (2400 mm) above floor.

### **2.12 BALL VALVES**

- A. Manufacturers:
  1. Conbraco Industries: [www.apollovalves.com](http://www.apollovalves.com).
  2. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  3. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union. Ductile iron valves shall have epoxy coated interiors.

### **2.13 PLUG VALVES**

- A. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, with epoxy coated interior, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.

- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.
- 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. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.
- L. Excavate in accordance with Section 31 23 16.
- M. Backfill in accordance with Section 31 23 23.
- N. Install bell and spigot pipe with bell end upstream.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- Q. Install water piping to ASME B31.9.
- R. Install fuel oil piping to ASME B31.9.
- S. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- T. Sleeve pipes passing through partitions, walls and floors.
- U. PVC Pipe shall not be installed in air plenums in accordance with ASTM E84
- V. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- W. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as scheduled.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 8. Provide copper plated hangers and supports for copper piping.
  - 9. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
  - 10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 05 48.
  - 11. Support cast iron drainage piping at every joint.

### 3.04 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. Solder adapters to pipe.

- C. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe valves for throttling, bypass, or manual flow control services.
- E. Provide spring loaded check valves on discharge of water pumps.
- F. Provide plug valves in natural gas systems for shut-off service.
- G. Provide flow controls in water recirculating systems where indicated.

### **3.05 TOLERANCES**

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### **3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Disinfect water distribution system in accordance with Section 33 13 00.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. 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).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### **3.07 SERVICE CONNECTIONS**

- A. Provide new 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. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
  - 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
  - 2. Provide 18 gage galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.
- C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

### **3.08 SCHEDULES**

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum hanger spacing: 6.5 ft.
      - 2) Hanger rod diameter: 3/8 inches.
    - b. Pipe size: 1-1/2 inches to 2 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 3/8 inch.

- c. Pipe size: 2-1/2 inches to 3 inches:
    - 1) Maximum hanger spacing: 10 ft.
    - 2) Hanger rod diameter: 1/2 inch.
  - d. Pipe size: 4 inches to 6 inches:
    - 1) Maximum hanger spacing: 10 ft.
    - 2) Hanger rod diameter: 5/8 inch.
  - e. Pipe size: 8 inches to 12 inches:
    - 1) Maximum hanger spacing: 14 ft.
    - 2) Hanger rod diameter: 7/8 inch.
  - f. Pipe size: 14 inches and Over:
    - 1) Maximum hanger spacing: 20 ft.
    - 2) Hanger rod diameter: 1 inch.
2. Plastic Piping:
- a. All Sizes:
    - 1) Maximum hanger spacing: 6 ft.
    - 2) Hanger rod diameter: 3/8 inch.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 22 10 06**  
**PLUMBING PIPING SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Drains.
- B. Cleanouts.
- C. Hydrants.
- D. Water hammer arrestors.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 22 40 00 - Plumbing Fixtures.
- C. Section 22 30 00 - Plumbing Equipment.
- D. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).
- C. ASME A112.6.4 - Roof, Deck, and Balcony Drains; The American Society of Mechanical Engineers; 2003.
- D. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1011).
- E. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; 2009 (ANSI/ASSE 1012).
- F. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering; 2011.
- G. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2011 (ANSI/ASSE 1019).
- H. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 2013.
- I. NSF 61 - Drinking Water System Components - Health Effects; 2012.
- J. NSF 372 - Drinking Water System Components - Lead Content; 2011.
- K. PDI-WH 201 - Water Hammer Arrestors; Plumbing and Drainage Institute; 2010.
- L. NSF 61 - Drinking Water System Components - Health Effects; 2012.
- M. NSF 372 - Drinking Water System Components - Lead Content; 2011.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Certificates: Certify that grease interceptors meet or exceed specified requirements.
- E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- F. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.
- G. Operation Data: Indicate frequency of treatment required for interceptors.

H. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

### **1.05 QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

A. Accept specialties on site in original factory packaging. Inspect for damage.

## **PART 2 PRODUCTS**

### **2.01 GENERAL REQUIREMENTS**

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

### **2.02 DRAINS**

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
2. Wade Drain (Tyler Pipe): [www.wadedrains.com](http://www.wadedrains.com)
3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Floor Drain (See Schedule on Drawings):

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer with raised flange.

### **2.03 CLEANOUTS**

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
2. Wade Drain (Tyler Pipe): [www.wadedrains.com](http://www.wadedrains.com)
3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cleanouts at Exterior Surfaced and Unsurfaced Areas (COTG/DCOTG):

1. Line type with lacquered heavy duty cast iron body and round epoxy coated gasketed cover.

C. Cleanouts at Interior Finished Floor Areas (FCO):

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

D. Cleanouts at Interior Finished Wall Areas (WCO):

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

### **2.04 HYDRANTS**

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
2. Woodford Manufacturing Company, [www.woodfordmfg.com](http://www.woodfordmfg.com)
3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

### **2.05 BACK WATER VALVES**

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).



2. Wade Drain (Tyler Pipe): [www.wadedrains.com](http://www.wadedrains.com)
  3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Cast Iron Back Water Valves: ANSI A112.21.2M; lacquered cast iron body and cover, brass valve, extension sleeve, and access cover.

## **2.06 WATER HAMMER ARRESTORS**

- A. Manufacturers:
1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  2. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- 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 concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to all quick closing valves.
- H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.
- I. Install precast-concrete interceptors according to ASTM C 891. Set level and plumb.
- J. Install manhole risers from top of underground concrete interceptors to manholes and grating sat finished grade.
- K. Set tops of manhole frames and covers flush with finished grade and/or surface.
- L. Set tops of grating frames and grates flush with finished surface.

### **3.02 CONNECTIONS**

- A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Make piping connections between interceptors and piping systems.

### **3.03 IDENTIFICATION**

- A. Identification materials and installation are specified in Section 312000 "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.
1. Use warning tapes or detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

**END OF SECTION**

**SECTION 22 40 00**  
**PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sinks.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 90 05 - Joint Sealers: Seal fixtures to walls and floors.
- B. Section 22 10 05 - Plumbing Piping.
- C. Section 22 10 06 - Plumbing Piping Specialties.
- D. Section 22 30 00 - Plumbing Equipment.
- E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z124.1.2 - American National Standard for Plastic Bathtub and Shower Units; 2005.
- B. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2009.
- C. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.
- D. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).
- E. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2012.
- F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008 (R2013).
- G. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).
- H. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; The American Society of Mechanical Engineers; 2011.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
- J. ISFA-2 - Classification and Standards for Solid Surfacing Material; International Solid Surface Fabricators Association; 2001 (2013)
- K. NSF 61 - Drinking Water System Components - Health Effects; 2012.
- L. NSF 372 - Drinking Water System Components - Lead Content; 2011.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

### **1.06 REGULATORY REQUIREMENTS**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

### **1.08 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

### **2.02 SINKS**

- A. Sink Manufacturers: (See Schedule on Drawings).
  - 1. Elkay Manufacturing: [www.elkay.com](http://www.elkay.com)
  - 2. Just Manufacturing: [www.justmfg.com](http://www.justmfg.com)
  - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Sink configurations:
  - 1. Self-rimming Double Compartment Bowl: ASME A112.19.3; 20 gage (0.9 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
- C. Supply Faucet Manufacturers: (See Schedule on Drawings).
  - 1. American Standard, Inc: [www.americanstandard-us.com](http://www.americanstandard-us.com).
  - 2. Kohler Company: [www.kohler.com](http://www.kohler.com).
  - 3. Chicago Faucets: [www.chicgofaucets.com](http://www.chicgofaucets.com)
  - 4. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Manual Faucet: ASME A112.18.1; chrome plated combination supply fitting without pop-up waste, water economy aerator with maximum flow of 2.2 gallons per minute (8.3 liters per minute), indexed handles.
- E. Accessories:
  - 1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
  - 2. Offset waste with perforated open strainer.
  - 3. Wheel handle stops.
  - 4. Flexible supplies.

## **PART 3 EXECUTION**

### **3.01 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.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### **3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

**3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- G. Replace all batteries with name brand-long life batteries at the end of construction.

**3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

**3.05 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

**3.06 CLEANING**

- A. Clean plumbing fixtures and equipment.

**3.07 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 23 05 10**  
**BASIC HVAC REQUIREMENTS**

**PART 1 GENERAL**

**1.01 PROJECT MANAGEMENT**

- A. Drawings are diagrammatic, all offsets, fitting, valves and accessories are not shown. Refer to all drawings in the contract documents and plan work accordingly. Coordinate with all trades and crafts.
- B. In case of interference between trades, Architect Engineer will decide which work is to take precedence regardless of work that might be installed.

**1.02 CODES, ORDINANCES, INSPECTIONS, AND PERMITS**

- A. Execute and inspect Work in accordance with local and state codes, laws, ordinances, rules and regulations applicable to particular class of Work.
- B. Should any part of Drawings or specifications be found to be in conflict with applicable codes or ordinances, notify the Architect Engineer, in writing, 72 hours prior to receiving of bids. After the receiving of bids, any discovery of code violations shall be promptly reported to the Architect Engineer. Any work performed knowingly in violation of codes shall be corrected without additional expense to the Owner or his representative.
- C. All plumbing work shall comply with latest local codes and the the State of Arkansas plumbing code.
- D. Arrange with County, City, or State, if City has no ordinances covering work, for complete inspection, paying all charges pertaining thereto. Give proper authority all requisite notice relating to work under such; afford Architect Engineer and all authorized inspectors every facility for inspection and be responsible for all violations of law. Upon completion of Work, have Work inspected, if required, obtaining certificate of inspection and approval from inspecting agency and deliver such certificate to Architect Engineer. Comply with Division 01.

**1.03 COORDINATION**

- A. Conduct multi-trade coordination and preinstallation meetings to establish bottom elevations of all piping, ductwork and conduit before fabrication and installation. Comply with Division 01.
- B. All equipment shall be installed in accordance with the manufacturer's recommendations. It is the contractor's responsibility to follow all installation requirements and guidelines provided in the manufacture's installation manual. If there is a conflict with regards to installation, the contractor shall stop work and notify the design Architect Engineer representative.

**1.04 SUBMITTALS**

- A. Comply with Division 01.
- B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for plumbing fixtures, plumbing specialties, plumbing equipment, HVAC equipment, HVAC piping specialties, air distribution devices and others as may be requested.
- C. Shop Drawings: Miscellaneous steel for pipe support, duct support, pipe guides, anchors, and miscellaneous steel used for supporting any mechanical equipment.

**1.05 SUBSTITUTIONS**

- A. Comply with Division 01.
- B. Any proposed substitutions of equipment shall be accompanied by shop drawings showing revised equipment layouts, piping diagrams, ductwork drawings and/or wiring diagrams. Where substituted equipment furnished requires use of larger, more, or differently arranged connections, such connections shall be installed to the complete satisfaction of Architect Engineer without additional cost to Owner.
- C. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the Contractor shall replace this material or equipment with that as originally specified, or corrected as directed by Architect Engineer.

**1.06 CLEAN UP**

- A. Comply with Division 01.
- B. Do not allow waste material or rubbish to accumulate in or about job site.
- C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep clean mechanical systems shall be repaired without cost to Owner.

**1.07 EQUIPMENT START-UP AND SYSTEM COORDINATION**

- A. Comply with Division 01.
- B. The Contractor shall be responsible for placing all equipment and system components into operation. Individual components shall be coordinated with other parts of Mechanical, Electrical, Plumbing and/or Fire Protection Systems to ensure that the entire project functions as designed and described by the contract documents.

**1.08 CUTTING AND PATCHING**

- A. Comply with Division 01.
- B. Provide all cutting and patching required to perform the mechanical work, when alteration, repair, renovation, or addition, to existing construction.

**1.09 DEMOLITION**

- A. Comply with Section 02 41 00 - Demolition.

**1.10 RECORD DOCUMENTS**

- A. Comply with Division 01.

**1.11 OPERATION INSTRUCTIONS**

- A. Comply with Division 01.
- B. Printed instructions, installed in a suitable frame with a glass front, covering the operation and maintenance of each major item of equipment, shall be posted at locations designated by the Architect Engineer. Provide 2 bound manuals containing complete repair parts lists, and operating service and maintenance instructions for all equipment provided.

**1.12 INSTRUCTION**

- A. Comply with Section 01 79 00 - Demonstration and Training.

**1.13 FLASHINGS**

- A. Refer to Division 07 for roof flashings.

**1.14 ACCESS PANELS**

- A. Comply with Section 08 31 00 - Access Doors.
- B. Provide access panels as necessary for servicing of fire dampers, smoke dampers, valves, VAV terminals and any other equipment in concealed spaces.

**1.15 PAINT EXTERIOR PIPING**

- A. All exterior steel piping shall be painted using a metal primer coat, second coat of enamel, top coat of enamel and a finish coat of gloss.
- B. Natural gas piping shall be painted yellow.

**1.16 LOCAL SITE CONDITIONS**

- A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Utility locations shown were obtained from surveys and/or local utility companies and are not to be assumed as being accurate.
- B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply as to condition of soil to be encountered.



### **1.17 GUARANTY-WARRANTY**

- A. This guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the true intent and purpose of these specifications. Conduct such tests as herein specified or as may be required by the Architect Engineer to demonstrate capacity and performance ability of various systems to maintain specified conditions.
- B. All materials and equipment shall be new and unused and shall carry a full year's warranty from time Owner accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections.

### **1.18 EQUIPMENT CONNECTIONS AND INSTALLATION**

- A. Each equipment item with drain connections, shall be provided with a properly-sized drain run to the nearest floor drain or as directed.
- B. Rough-in and make final connection to all equipment requiring same, furnished under other Divisions of these specifications or by the Owner.
  - 1. Provide necessary labor and materials, including stop valves, traps, pressure-reducing valves, etc. necessary. Trap and vent drainage connections as required.
  - 2. If equipment or fixtures to be furnished by Owner and/or Owner's vendor are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.
- C. No equipment or fixture shall be "roughed-in" until proper rough-in drawings are in the hands of the trade doing the work.
- D. Unless another form of vibration isolation is used, all equipment shall be mounted at least on neoprene pads.

### **1.19 ELECTRICAL**

- A. Furnish and install all electrical interlock, control and other wiring, not covered specifically under the electrical plans and specifications, for proper operation and control of all equipment specified under this Division of the specifications.
- B. Supervise and coordinate all electrical work in connection with mechanical system.

### **1.20 MOTOR CONTROLLERS**

- A. Furnish all motor controllers or contactors, not furnished as part of a motor control center, for proper operation of all motors.
- B. Where motor controllers or contactors are furnished as part of a motor control center, provide a schedule of every motor or equipment item furnished, its voltage requirements, type controller required, accessories required and interlocks. This schedule shall be submitted within 45 days of Notice to Proceed to Architect Engineer and supplier of motor control center for approval.
- C. Provide variable frequency drive controllers on all HVAC fan and pump motors that are three phase powered regardless if they serve a constant flow or variable flow system.
- D. Provide variable speed solid state controllers on all HVAC fan motors that are single phase powered.
- E. All starters and switches shall be in a proper NEMA enclosure and shall be identified with engraved laminated plastic label.

### **1.21 EQUIPMENT FEATURES**

- A. All belt driven fans shall include an automatic belt tensioner to maintain belt tension after start-up.

### **1.22 EXCAVATION, TRENCHING, AND BACKFILLING**

- A. All excavation, trenching and backfilling in connection with the mechanical system, to a point 5'0" outside the building, is included as part of this Division.

- B. All excavation required shall be done as part of the bid price regardless of any implied conditions on the plans or in these specifications.
- C. Excavation to have 12 inch minimum and 24 inch maximum clearance on all sides. Do not carry excavation below required level unless indicated otherwise on the drawings. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel or concrete, as directed by Architect Engineer and thoroughly compacted. Remove any unstable soil and replace with gravel, crushed stone or clean sand and thoroughly compact. Architect Engineer will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to excavations to prevent water running in. Remove, by pumping or other means any water accumulated in excavation.
- D. Banks of trenches shall be vertical or as shown on the drawings. Width of trench to be 5 inches minimum, 8 inches maximum on each side of pipe bell. Bottom of trench for sewers and culverts shall be rounded so that an arc of circumference equal to 0.6 of outside diameter or pipe rests on undisturbed soil wherever practicable. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8 inches below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.
- E. Bracing, sheathing and shoring shall be performed as necessary to complete and protect excavations indicated on the drawings, as required for safety, as directed by Architect Engineer, or to conform to governing laws.
- F. After piping, conduit, ducts, etc. have been installed, inspected, tested and approved by governing agency, backfill trenches with clean, stable soil free from stones. Place backfill in 4 inch layers, tamped under and around pipe and conduit to height of at least 2'0" above pipe. Tamping shall be done in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8 inch layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand. Compaction tests in accordance with Division 31 may be required by the Architect Engineer, with the costs paid by the Contractor.
- G. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless otherwise directed.

### **1.23 SEISMIC QUALIFICATION OF EQUIPMENT**

- A. Provide manufacturer's certificate of compliance for the following equipment requiring seismic qualifications.
  - 1. Air handling equipment
  - 2. Air terminal units
  - 3. Boilers
  - 4. Pumps
  - 5. Heat Exchangers
  - 6. Chillers

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 23 23 00**  
**REFRIGERANT PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Check valves.
- G. Pressure relief valves.
- H. Filter-driers.
- I. Solenoid valves.
- J. Expansion valves.
- K. Flexible connections.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 00 - Access Doors and Panels.
- C. Section 09 90 00 - Painting and Coating.
- D. Section 22 07 19 - Plumbing Piping Insulation.
- E. Section 22 07 16 - Plumbing Equipment Insulation.
- F. Section 23 07 19 - HVAC Piping Insulation.
- G. Section 23 63 13 - Air Cooled Refrigerant Condensers.
- H. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

- A. AHRI 750 - Standard for Thermostatic Refrigerant Expansion Valves; Air-Conditioning, Heating, and Refrigeration Institute; 2007.
- B. AHRI 760 - Standard for Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; Air-Conditioning, Heating, and Refrigeration Institute; 2007.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013 (ANSI/ASHRAE Std 15).
- D. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2013.
- E. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2013.
- F. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes; The American Society of Mechanical Engineers; 2013.
- G. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; The American Society of Mechanical Engineers; 2013.
- H. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2011 (ANSI/ASME B31.9).
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.
- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

- K. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2013.
- L. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2011 and errata.
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
- N. UL 429 - Electrically Operated Valves; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

#### 1.04 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 ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
  - 1. Use line size liquid indicators in main liquid line leaving condenser.
  - 2. If receiver is provided, install in liquid line leaving receiver.
  - 3. Use line size on leaving side of liquid solenoid valves.
- D. Valves:
  - 1. Use service valves on suction and discharge of compressors.
  - 2. Use gage taps at compressor inlet and outlet.
  - 3. Use gage taps at hot gas bypass regulators, inlet and outlet.
  - 4. Use check valves on compressor discharge.
  - 5. Use check valves on condenser liquid lines on multiple condenser systems.
- E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
- F. Strainers:
  - 1. Use line size strainer upstream of each automatic valve.
  - 2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
  - 3. On steel piping systems, use strainer in suction line.
  - 4. Use shut-off valve on each side of strainer.
- G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.
- H. Filter-Driers:
  - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
  - 2. Use a filter-drier on suction line just ahead of compressor.
  - 3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
  - 4. Use sealed filter-driers in low temperature systems.
  - 5. Use sealed filter-driers in systems utilizing hermetic compressors.
  - 6. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
  - 7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
  - 8. Use filter-driers for each solenoid valve.
- I. Solenoid Valves:
  - 1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
  - 2. Use in liquid line of single or multiple evaporator systems.
  - 3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

- J. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
- C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Test Reports: Indicate results of leak test, acid test.
- F. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.
- G. Submit welders certification of compliance with ASME (BPV IX).
- H. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.
- I. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Filter-Dryer Cartridges: One of each type and size.
  - 3. Refrigeration Oil Test Kits: One, each containing everything required to conduct one test.

#### **1.06 QUALITY ASSURANCE**

- A. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of documented experience.

#### **1.07 REGULATORY REQUIREMENTS**

- A. Conform to ASME B31.9 for installation of piping system.
- B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- C. Welders Certification: In accordance with ASME (BPV IX).
- D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store piping and specialties in shipping containers with labeling in place.
- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

### **PART 2 PRODUCTS**

#### **2.01 PIPING**

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
  - 1. Fittings: ASME B16.22 wrought copper.
  - 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.
- B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.

1. Fittings: ASME B16.26 cast copper.
  2. Joints: Flared.
- C. Pipe Supports and Anchors:
1. Provide hangers and supports that comply with MSS SP-58.
    - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  5. Vertical Support: Steel riser clamp.
  6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
  7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
  8. Inserts: Malleable iron case of galvanized steel shell 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.

## 2.02 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

## 2.03 VALVES

- A. Diaphragm Packless Valves:
1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.
- B. Packed Angle Valves:
1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.
- C. Ball Valves:
1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.
- D. Service Valves:
1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

## 2.04 STRAINERS

- A. Straight Line or Angle Line Type:
1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.
- B. Straight Line, Non-Cleanable Type:
1. Steel shell, copper plated fittings, stainless steel wire screen, for maximum working pressure of 125 psi.

## 2.05 CHECK VALVES

- A. Globe Type:
1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 425 psi.
- B. Straight Through Type:

1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 200 degrees F.

## **2.06 PRESSURE REGULATORS**

- A. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi range, for maximum working pressure of 450 psi.

## **2.07 PRESSURE RELIEF VALVES**

- A. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi.

## **2.08 FILTER-DRIERS**

- A. Performance:
  1. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
  2. Design Working Pressure: 350 psi, minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
  1. Replaceable Core Type: Steel shell with removable cap.
  2. Sealed Type: Copper shell.
  3. Connections: As specified for applicable pipe type.

## **2.09 SOLENOID VALVES**

- A. Valve: AHRI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi.
- B. Coil Assembly: UL 429, UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

## **2.10 EXPANSION VALVES**

- A. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non-replaceable capillary tube and remote sensing bulb and remote bulb well.
- B. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

## **2.11 ELECTRONIC EXPANSION VALVES**

- A. Valve:
  1. Brass body with flared or solder connection, needle valve with floating needle and machined seat, stepper motor drive.
- B. Evaporation Control System:
  1. Electronic microprocessor based unit in enclosed case, proportional integral control with adaptive superheat, maximum operating pressure function, preselection allowance for electrical defrost and hot gas bypass.
- C. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

## 2.12 FLEXIBLE CONNECTORS

- A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### 3.02 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. 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.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 31 00.
- H. Flood piping system with nitrogen when brazing.
- I. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.
- K. Insulate piping and equipment; refer to Section and Section 22 07 16.
- L. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- M. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- N. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- O. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- P. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
- Q. Fully charge completed system with refrigerant after testing.
- R. Provide electrical connection to solenoid valves. Refer to Section 26 27 17.

### 3.03 FIELD QUALITY CONTROL

- A. Test refrigeration system in accordance with ASME B31.5.
- B. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

### 3.04 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
  - 1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
  - 2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
  - 3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.



4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. 2-5/8 inch OD: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. 3-1/8 inch OD: Maximum span, 10 feet; minimum rod size, 3/8 inch.
8. 3-5/8 inch OD: Maximum span, 11 feet; minimum rod size, 1/2 inch.
9. 4-1/8 inch OD: Maximum span, 12 feet; minimum rod size, 1/2 inch.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 23 31 00**  
**HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Casing and plenums.
- D. Kitchen hood ductwork.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 07 84 00 - Firestopping.
- D. Section 09 90 00 - Painting and Coating: Weld priming, weather resistant, paint or coating.
- E. Section 23 07 13 - Duct Insulation: External insulation and duct liner.
- F. Section 23 33 00 - Air Duct Accessories.
- G. Section 23 36 00 - Air Terminal Units.
- H. Section 23 37 00 - Air Outlets and Inlets.
- I. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

**1.03 REFERENCE STANDARDS**

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications; 2012.
- C. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2013.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- F. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2014.
- G. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.
- H. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.
- I. SMACNA (FGD) - Fibrous Glass Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2003.
- J. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines; 2001.
- K. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.
- D. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed specified requirements.

### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

### 1.06 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A standards.

### 1.07 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

## PART 2 PRODUCTS

### 2.01 DUCT ASSEMBLIES

- A. All Ducts: Galvanized steel, unless otherwise indicated.
- B. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel.
- C. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. pressure class, galvanized steel.
- D. Medium and High Pressure Supply: 1/2 inch w.g. pressure class, galvanized steel.
- E. Return and Relief: 1/2 inch w.g. pressure class, galvanized steel.
- F. General Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
- G. Kitchen Cooking Hood Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
  - 1. Construct of 16 gage un-galvanized steel using continuous external welded joints in rectangular sections.
  - 2. Construct of 18 gage stainless steel using continuous external welded joints in rectangular sections.
- H. Dishwasher Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
  - 1. Construct of 16 gage un-galvanized steel using continuous external welded joints in rectangular sections.
  - 2. Construct of 18 gage stainless steel using continuous external welded joints in rectangular sections.
- I. Grease Exhaust: 1/2 inch w.g. pressure class, stainless steel.
  - 1. Construct of ASTM A1011/A1011M 16 gage un-galvanized steel.
  - 2. Construction:
    - a. Liquid tight with continuous external weld for all seams and joints.
    - b. Where ducts are not self draining back to equipment, provide low point drain pocket with copper drain pipe to sanitary sewer.
  - 3. Access Doors:
    - a. Provide for duct cleaning inside horizontal duct at drain pockets, every 20 feet and at each change of direction.
    - b. Use same material and thickness as duct with gaskets and sealants rated 1500 degrees F for grease tight construction.
- J. Fume Hood Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
- K. Outside Air Intake: 1/2 inch w.g. pressure class, galvanized steel.
- L. Combustion Air: 1/2 inch w.g. pressure class, galvanized steel.
- M. Evaporative Condenser Intake and Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
- N. Emergency Generation Ventilation: 1/2 inch w.g. pressure class, galvanized steel.
- O. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class, fibrous glass.

## 2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Stainless Steel for Ducts: ASTM A 240/A 240M, Type 304.

## 2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.

## 2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flat Oval Ducts: Machine made from round spiral lockseam duct.
  - 1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards.
  - 2. Fittings: Manufacture at least two gages heavier metal than duct.
  - 3. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Double Wall Insulated Flat Oval Ducts: Machine made from round spiral lockseam duct.
  - 1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards.
  - 2. Fittings: Manufacture with solid inner wall.
  - 3. Inner wall: Perforated galvanized steel.
- C. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.
  - 1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards.
  - 2. Manufacturers:
- D. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
  - 1. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
  - 2. Maximum Velocity: 4000 fpm.
  - 3. Temperature Range: -10 degrees F to 160 degrees F.
- E. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.
- F. Kitchen Cooking Hood Exhaust: Nominal 3 inches thick ceramic fiber insulation between 20 gage, 304 stainless steel liner and 24 gage, aluminized steel outer jacket.
  - 1. Tested and UL listed for use with commercial cooking equipment in accordance with NFPA 96.
  - 2. Certified for zero clearance to combustible material in accordance with:
  - 3. Materials and construction of the modular sections and accessories to be in accordance with the terms of the following listings:
- G. Grease Exhaust: Nominal 3 inches thick ceramic fiber insulation between 20 gage, 304 stainless steel liner and 24 gage, aluminized steel outer jacket.
  - 1. Tested and UL listed for use with commercial cooking equipment in accordance with NFPA 96.
  - 2. Certified for zero clearance to combustible material in accordance with:
  - 3. Materials and construction of the modular sections and accessories to be in accordance with the terms of the following listings:
    - a. UL 1978.
  - 4. Manufacturers:
- H. Dishwasher Exhaust: Minimum 0.035 inches thick, single wall, type 304 stainless steel.

1. Single wall, factory built chimney liner system.
  2. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.
  3. Joints to be sealed during installation with factory supplied overlapping V-bands and sealant.
- I. Fume Hood Exhaust: Minimum 0.035 inches thick, single wall, type 304 stainless steel.
1. Single wall, factory built chimney liner system.
  2. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.
  3. Joints to be sealed during installation with factory supplied overlapping V-bands and sealant.

## **2.05 CASINGS**

- A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.
- B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

## **2.06 FIBROUS GLASS DUCTS**

- A. Fibrous Glass Ducts: 1 inch thick rigid glass fiber with aluminum foil, glass scrim and Kraft or plastic jacket vapor barrier; maximum 0.23 K value at 75 degrees F.
- B. Fabricate in accordance with SMACNA Fibrous Glass Duct Construction Standards, except as indicated.
- C. Machine fabricate fibrous glass ducts and fittings. Make only minor on site manual adjustments.
- D. Do not use fibrous glass ducts within 12 inches of electric or fuel fired heaters.

## **2.07 KITCHEN HOOD EXHAUST DUCTWORK**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, SMACNA Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines and NFPA 96.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Kitchen Hood Exhaust: Provide residue traps at base of vertical risers with provisions for clean out.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- H. Use double nuts and lock washers on threaded rod supports.

- I. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
- J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- K. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
- L. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 23 34 23**  
**HVAC POWER VENTILATORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Roof exhausters.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 05 13 - Common Motor Requirements for Plumbing Equipment.
- B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- C. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.
- D. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.
- E. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.
- F. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

- A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2010.
- B. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.
- C. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).
- D. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; <http://www.amca.org/certified/search/company.aspx>.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2008.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2007.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2014.
- I. UL 705 - Power Ventilators; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- J. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.06 FIELD CONDITIONS**

- A. Permanent ventilators may not be used for ventilation during construction.

## **PART 2 PRODUCTS**

### **2.01 POWER VENTILATORS - GENERAL**

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Conform to AMCA 99.
- E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- G. Enclosed Safety Switches: Conform to NEMA 250.
- H. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

### **2.02 ROOF EXHAUSTERS**

- A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- B. Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted solid state speed controller.
- D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Hung Cabinet Fans:
  - 1. Install fans with resilient mountings and flexible electrical leads. Refer to Section 22 05 48.
  - 2. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- E. Provide sheaves required for final air balance.
- F. Install backdraft dampers on inlet to roof and wall exhausters.
- G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

**END OF SECTION**

**SECTION 23 81 29**

**VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Variable refrigerant volume HVAC system includes:
  - 1. Outdoor/Condensing unit(s).
  - 2. Indoor/Evaporator units.
  - 3. Refrigerant piping.
  - 4. Control panels.
  - 5. Control wiring.
- B. Basis of Design Equipment List is in Section 23 81 30.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 23 00 - Alternates: List of alternates relevant to this section.
- B. Section 23 23 00 - Refrigerant Piping and Specialties: Additional requirements for refrigerant piping system.
- C. Section 26 27 17 - Equipment Wiring: Power connections to equipment.
  - 1. Provide separate power connections for each unit of equipment.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Alternates: See Section 01 23 00 - Alternates, for product alternatives affecting this section.
- B. Alternates: Owner requests a bid Alternate for a system designed and manufactured by a manufacturer other than that listed as the Basis of Design.
  - 1. Alternate systems will be considered only under the terms described for Substitutions in the article MANUFACTURERS in PART 2 of this section.
  - 2. Contractor shall include with his bid the amount to be deducted from the bid amount if the alternate is accepted by the Owner.

**1.04 REFERENCE STANDARDS**

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.
- B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2011.
- C. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc; 2013, Including All Addenda (ANSI/ASHRAE/IES Std 90.1).
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

**1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

**1.06 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Pre-Bid Submittals: For proposed substitute systems/products, as defined in PART 2, and alternate systems/products, as defined above, proposer shall submit all data described in this article, under the terms given for substitutions stated in PART 2.
- C. Design Data:
  - 1. Provide design calculations showing that system will achieve performance specified.
  - 2. Provide design data required by ASHRAE 90.1.

- D. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings shown in the contract documents:
1. Outdoor/Central Units:
    - a. Refrigerant Type and Size of Charge.
    - b. Cooling Capacity: Btu/h.
    - c. Heating Capacity: Btu/h.
    - d. Cooling Input Power: Btu/h.
    - e. Heating Input Power: Btu/h.
    - f. Operating Temperature Range, Cooling and Heating.
    - g. Air Flow: Cubic feet per minute.
    - h. Fan Curves.
    - i. External Static Pressure (ESP): Inches WG.
    - j. Sound Pressure Level: dB(A).
    - k. Electrical Data:
      - 1) Maximum Circuit Amps (MCA).
      - 2) Maximum Fuse Amps (MFA).
      - 3) Maximum Starting Current (MSC).
      - 4) Full Load Amps (FLA).
      - 5) Total Over Current Amps (TOCA).
      - 6) Fan Motor: HP.
    - l. Weight and Dimensions.
    - m. Maximum number of indoor units that can be served.
    - n. Maximum refrigerant piping run from outdoor/condenser unit to indoor/evaporator unit.
    - o. Maximum height difference between outdoor/condenser unit to indoor/evaporator unit, both above and below.
    - p. Control Options.
  2. Indoor/Evaporator Units:
    - a. Cooling Capacity: Btu/h.
    - b. Heating Capacity: Btu/h.
    - c. Cooling Input Power: Btu/h.
    - d. Heating Input Power: Btu/h.
    - e. Air Flow: Cubic feet per minute.
    - f. Fan Curves.
    - g. External Static Pressure (ESP): Inches WG.
    - h. Sound Pressure level: dB(A).
    - i. Electrical Data:
      - 1) Maximum Circuit Amps (MCA).
      - 2) Maximum Fuse Amps (MFA).
      - 3) Maximum Starting Current (MSC).
      - 4) Full Load Amps (FLA).
      - 5) Total Over Current Amps (TOCA).
      - 6) Fan Motor: HP.
    - j. Maximum Lift of Built-in Condensate Pump.
    - k. Weight and Dimensions.
    - l. Control Options.
  3. Control Panels: Complete description of options, control points, zones/groups.
- E. Specimen Warranty: Copy of manufacturer's warranties.
- F. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:
1. Detailed piping diagrams, with branch balancing devices.

2. Condensate piping routing, size, and pump connections.
  3. Detailed power wiring diagrams.
  4. Detailed control wiring diagrams.
  5. Locations of required access through fixed construction.
  6. Drawings required by manufacturer.
- G. Operating and Maintenance Data:
1. Manufacturer's complete standard instructions for each unit of equipment and control panel.
  2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.
  3. Identification of replaceable parts and local source of supply.
- H. Project Record Documents: Record the following:
1. As-installed routing of refrigerant piping and condensate piping.
  2. Locations of access panels.
  3. Locations of control panels.
- I. Warranty: Executed warranty, made out in Owner's name.

### **1.07 QUALITY ASSURANCE**

- A. Manufacturer Qualifications:
1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.
  2. Company that provides system design software to installers.
- B. Installer Qualifications: Trained and approved by manufacturer of equipment.

### **1.08 DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

### **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Compressors: Provide manufacturer's warranty for six (6) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of Daikin AC (Americas), Inc. according to Daikin's terms and conditions. All warranty service work shall be preformed by a Daikin factory trained service professional.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Systems designed and manufactured by other manufacturers will be considered by Owner under the terms described for substitutions with the following exceptions:
1. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Substitution requests will be considered only if required submittal data is complete; see article SUBMITTALS above.
  3. Contractor (not equipment supplier) shall certify that the use of the substitute system and equipment will not require changes to other work or re-design by Architect Engineer.
  4. Contractor or HVAC subcontractor shall certify that the substitute system will achieve the performance specified.
  5. Do not assume substitution has been accepted until formal written notice has been issued by Architect Engineer.

### **2.02 HVAC SYSTEM DESIGN**

- A. System Operation: Heating and cooling, simultaneously.
1. Zoning: Provide capability for temperature control for each individual indoor/evaporator unit independently of all other units.

2. Zoning: Provide heating/cooling selection for each individual indoor/evaporator unit independently of all other units.
  3. Provide a complete functional system that achieves the specified performance based on the specified design conditions and that is designed and constructed according to the equipment manufacturer's requirements.
  4. Conditioned spaces are shown on the drawings.
  5. Outdoor/Condenser unit locations are shown on the drawings.
  6. Indoor/Evaporator unit locations are shown on the drawings.
  7. Branch selector unit locations are not shown on the drawings.
  8. Required equipment unit capacities are shown on the drawings.
  9. Refrigerant piping sizes are not shown on the drawings.
  10. Connect equipment to condensate piping provided by others; condensate piping is shown on the drawings.
- B. Cooling Mode Interior Performance:
1. Daytime Setpoint: 68 degrees F, plus or minus 2 degrees F.
  2. Setpoint Range: 57 degrees F to 77 degrees F.
  3. Night Setback: 78 degrees F.
  4. Interior Relative Humidity: 20 percent, maximum.
- C. Heating Mode Interior Performance:
1. Daytime Setpoint: 68 degrees F, plus or minus 2 degrees F.
  2. Setpoint Range: 59 degrees F to 80 degrees F.
  3. Night Setback: 60 degrees F.
  4. Interior Relative Humidity: 10 percent, minimum.
- D. Operating Temperature Ranges:
1. Simultaneous Heating and Cooling Operating Range: minus 4 degrees F to 60 degrees F dry bulb.
  2. Cooling Mode Operating Range: minus 4 degrees F to 110 degrees F dry bulb.
  3. Heating Mode Operating Range: 0 degrees F to 77 degrees F dry bulb; minus 4 degrees F to 60 degrees F wet bulb; without low ambient controls or auxiliary heat source.
- E. Refrigerant Piping Lengths: Provide equipment capable of serving system with following piping lengths without any oil traps:
1. Minimum Piping Length from Outdoor/Central Unit(s) to Furthest Terminal Unit: 540 feet, actual; 620 feet, equivalent.
  2. Total Combined Liquid Line Length: 3280 feet, minimum.
  3. Minimum Piping Length Between Indoor Units: 49 feet.
- F. Control Wiring Lengths:
1. Between Outdoor/Condenser Unit and Indoor/Evaporator Unit: 6,665 feet, minimum.
  2. Between Outdoor/Condenser Unit and Central Controller: 3,330 feet, minimum.
  3. Between Indoor/Evaporator Unit and Remote Controller: 1,665 feet.
- G. Controls: Provide the following control interfaces:
1. For Each Indoor/Evaporator Unit: One wall-mounted wired "local" controller, with temperature sensor; locate where indicated.
  2. Remote, multizone on/off control panels sufficient to control all units; locate where indicated.
  3. One central remote control panel for entire system; locate where indicated.
  4. One time clock control panel for entire system; locate where indicated.
  5. LonWorks gateways sufficient to connect all units to building automation system by others; include wiring to gateways.
  6. The building automation system by the VRV manufacturer is not specified in this section. Consult the manufacturer for details.
  7. Building automation system by HVAC system manufacturer ; provide one user stations located where indicated.

- H. Local Controllers: Wall-mounted, wired, containing temperature sensor.
- I. Remote Temperature Sensors: In addition to temperature sensors integral with indoor/evaporator units, provide wall-mounted, wired remote temperature sensors located in the same room for the following:
  - 1. In-ceiling mounted units.
  - 2. On-ceiling mounted units.
  - 3. Wall mounted units mounted up high.
  - 4. Air handling units.
  - 5. Concealed console units.
  - 6. Exception: Where a local controller with temperature sensor is provided for the particular unit and is located in the same space.

### 2.03 EQUIPMENT

- A. All Units: Factory assembled, wired, and piped and factory tested for function and safety.
  - 1. Refrigerant: R-410A.
  - 2. Performance Certification: AHRI Certified; [www.ahrinet.org](http://www.ahrinet.org).
  - 3. Safety Certification: Tested to UL 1995 by UL or Intertek-ETL and bearing the certification label.
  - 4. Provide outdoor/condensing units capable of serving indoor unit capacity up to 200 percent of the capacity of the outdoor/condensing unit.
  - 5. Provide units capable of serving the zones indicated.
  - 6. Thermal Performance: Provide heating and cooling capacity as indicated, based on the following nominal operating conditions:
    - a. Cooling: Indoor air temperature of 80 degrees F dry bulb, 67 degrees F wet bulb; outdoor air temperature of 95 degrees F dry bulb; and 25 feet
    - b. Heating: Outdoor air temperature of 47 degrees F dry bulb, 43 degrees F wet bulb; indoor air temperature of 70 degrees F dry bulb; and 25 feet
  - 7. Energy Efficiency: Report EER and COP based on tests conducted at "full load" in accordance with AHRI 210/240 or alternate test method approved by U.S. Department of Energy.
  - 8. Outdoor Units: Units and their supports designed and installed to resist wind pressures defined in ASCE 7.
- B. Electrical Characteristics:
  - 1. Power - Indoor Units: 208 to 230 Volts, single phase, 60 Hz.
  - 2. 208-230 Voltage Range: 187 to 253 volts.
  - 3. Control: 16 volts DC.
- C. System Controls:
  - 1. Include self diagnostic, auto-check functions to detect malfunctions and display the type and location.
- D. Remote Centralized Control Panel:
- E. Remote On/Off Control Panel:
- F. Time Clock Panel:
- G. Unit Controls: As required to perform input functions necessary to operate system; provided by manufacturer of units.
  - 1. Provide interfaces to remote control and building automation systems as specified.
  - 2. Outside air capability.
- H. Wiring:
  - 1. Control Wiring: 18 AWG, 2-conductor, non-shielded, non-polarized, stranded cable.
  - 2. Control Wiring Configuration: Daisy chain.
- I. Refrigerant Piping:

1. Provide three-pipe refrigerant system, including high/low pressure dedicated hot gas, liquid and suction lines; two-pipe systems utilizing lower temperature mixed liquid/gas refrigerant to perform heat recovery are not permitted due to reduced heating capabilities.
2. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.
3. Insulate each refrigerant line individually between the condensing and indoor units.

#### **2.04 OUTDOOR/CONDENSING UNITS**

- A. Outdoor/Condensing Units: Air-cooled DX refrigeration units, designed specifically for use with indoor/evaporator units; factory assembled and wired with all necessary electronic and refrigerant controls; modular design for ganging multiple units.
  1. Refrigeration Circuit: Scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
  2. Refrigerant: Factory charged.
  3. Variable Volume Control: Modulate compressor capacity automatically to maintain constant suction and condensing pressures while varying refrigerant volume to suit heating/cooling loads.
  4. Capable of being installed with wiring and piping to the left, right, rear or bottom.
  5. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle (cooling mode) oil return or defrost is not permitted, due to potential reduction in space temperature.
  6. Sound Pressure Level: As specified, measured at 3 feet from front of unit; provide night setback sound control as a standard feature; three selectable sound level steps of 55 dB, 50 dB, and 45 dB, maximum.
  7. Power Failure Mode: Automatically restart operation after power failure without loss of programmed settings.
  8. Provide refrigerant auto-charging feature and refrigerant charge check function.
  9. Safety Devices: High pressure sensor and switch, low pressure sensor/switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
  10. Provide refrigerant sub-cooling to ensure the liquid refrigerant does not flash when supplying to us indoor units.
  11. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.
  12. Controls: Provide contacts for electrical demand shedding.
- B. Unit Cabinet: Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
  1. Designed to allow side-by-side installation with minimum spacing.
- C. Fans: One or more direct-drive propeller type, vertical discharge, with multiple speed operation via DC (digitally commutating) inverter.
  1. Provide minimum of 2 fans for each condensing unit.
  2. External Static Pressure: Factory set at 0.12 in WG, minimum.
  3. Indoor Mounted Air-Cooled Units: External static pressure field set at 0.32 in WG, minimum; provide for mounting of field-installed ducts.
  4. Fan Airflow: As indicated for specific equipment.
  5. Fan Motors: Factory installed; permanently lubricated bearings; inherent protection; fan guard; output as indicated for specific equipment.
- D. Condenser Coils: Copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.



- E. Compressors: Scroll type, hermetically sealed, variable speed inverter-driven and fixed speed in combination to suit total capacity; minimum of one variable speed, inverter driven compressor per condenser unit; minimum of two compressors per condenser unit; capable of controlling capacity within range of 6 percent to 100 percent of total capacity.
1. Variable Speed Control: Capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure; high/low pressures calculated by samplings of evaporator and condenser temperatures every 20 seconds, with compressor capacity adjusted to eliminate deviation from target value by changing inverter frequency or on/off setting of fixed speed compressors.
  2. Multiple Condenser Modules: Balance total operation hours of compressors by means of duty cycling function, providing for sequential starting of each module at each start/stop cycle, completion of oil return, and completion of defrost, or every 8 hours.
  3. Failure Mode: In the event of compressor failure, operate remaining compressor(s) at proportionally reduced capacity; provide microprocessor and associated controls specifically designed to address this condition.
  4. Inverter Driven Compressors: PVM inverter driven, highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G2-type" with maximum speed of 7,980 rpm.
  5. Provide each compressor with crankcase heater, high pressure safety switch, and internal thermal overload protector.
  6. Provide oil separators and intelligent oil management system.
  7. Provide spring mounted vibration isolators.

## 2.05 INDOOR/EVAPORATOR UNITS

- A. All Indoor/Evaporator Units: Factory assembled and tested DX fan-coil units, with electronic proportional expansion valve, control circuit board, factory wiring and piping, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
1. Refrigerant: Refrigerant circuits factory-charged with dehydrated air, for field charging.
  2. Temperature Control Mechanism: Return air thermistor and computerized Proportional-Integral-Derivative (PID) control of superheat.
  3. Dehumidification Function: In conjunction with wall-mounted wired remote controller.
  4. Coils: Direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
    - a. Provide thermistor on liquid and gas lines.
  5. Fans: Direct-drive, with statically and dynamically balanced impellers; high and low speeds unless otherwise indicated; motor thermally protected.
  6. Return Air Filter: Washable long-life net filter with mildew proof resin, unless otherwise indicated.
  7. Condensate Drainage: Built-in condensate drain pan with PVC drain connection.
    - a. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.
  8. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.
- B. Wall Surface-Mounted Units: Finished white casing, with removable front grille; foamed polystyrene and polyethylene sound insulation; wall mounting plate; polystyrene condensate drain pan.
1. Airflow Control: Auto-swing louver that closes automatically when unit stops; five (5) steps of discharge angle, set using remote controller; upon restart, discharge angle defaulting to same angle as previous operation.
  2. Sound Pressure Range: Measured at low speed at 3.3 feet below and away from unit.
  3. Condensate Pump: Built-in, concealed.
  4. Condensate Drain Connection: Back, with piping concealed in wall.
  5. Fan: Direct-drive cross-flow type.
- C. Exposed Console Units: Top discharge grille, bottom return air; finished casing, sound-insulated with fiberglass urethane foam; auto-swing louver that closes automatically when unit stops.
1. Floor Mounting: Refrigerant and condensate lines directed downward.

2. Wall Mounting: Side (horizontal) refrigerant and condensate connections; manufacturer-supplied wall mounting template.
3. Maintenance Access Required: Not more than 3/4 inch in rear, 4 inch on each side.
4. Sound Pressure Range: Measured at high speed at 5 feet away and 5 feet above floor.
5. Fan: Sirocco type.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.
- B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.
- C. Notify Architect Engineer if conditions for installation are unsatisfactory.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install refrigerant piping in accordance with equipment manufacturer's instructions.
- C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).
- D. Coordinate with installers of systems and equipment connecting to this system.

#### **3.03 FIELD QUALITY CONTROL**

- A. Provide manufacturer's field representative to inspect installation prior to startup.

#### **3.04 SYSTEM STARTUP**

- A. Provide manufacturer's field representative to perform system startup.
- B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.
- C. Adjust equipment for proper operation within manufacturer's published tolerances.

#### **3.05 CLEANING**

- A. Clean exposed components of dirt, finger marks, and other disfigurements.

#### **3.06 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstrate proper operation of equipment to Owner's designated representative.
- D. Demonstration: Demonstrate operation of system to Owner's personnel.
  1. Use operation and maintenance data as reference during demonstration.
  2. Briefly describe function, operation, and maintenance of each component.
- E. Training: Train Owner's personnel on operation and maintenance of system.
  1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  2. Provide minimum of two hours of training.
  3. Instructor: Manufacturer's training personnel.
  4. Location: At project site.

#### **3.07 PROTECTION**

- A. Protect installed components from subsequent construction operations.
- B. Replace exposed components broken or otherwise damaged beyond repair.

**3.08 MAINTENANCE**

- A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 26 00 10**  
**ELECTRICAL GENERAL PROVISIONS**

**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Work covered by this specification shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on accompanying plans and specified herein, and make final connections to all equipment.
- B. This work shall include: The general layout of the complete electrical system; arrangement of feeders, circuits, outlets, switches, controls, panelboards, transformers, service equipment, fixtures, and other work. No rough-in or connection, etc. for mechanical equipment shall be done until coordination is completed with Division 23.

**1.02 RELATED WORK**

- A. The Contractor shall be familiar with any work specified elsewhere in these specifications. Perform this work as specified herein.

**1.03 LOCAL CONDITIONS**

- A. Unless otherwise required or specified under another section of these specifications, cutting and patching will be performed by the Contractor. Division 26 shall furnish sketches showing locations and sizes of all openings, chases, etc. required for the installation of work.
- B. Division 26 shall furnish and locate sleeves and inserts required before floors and walls are built or he shall be responsible for the cost of cutting and patching required where such sleeves and inserts are not installed or where incorrectly located. Division 26 shall do all drilling required for installation of the hangers.
- C. No cutting shall be permitted to any of the structural members without the written permission of the Architect Engineer.
- D. Where openings are cut to permit installation of work, or cut to repair or remodel, any defects that may appear up to expiration of guarantee, patching shall be done by the trade whose work is disturbed, but shall be paid for by the Division cutting openings or causing the damage.
- E. Roof curbs for electrical openings shall be provided and flashed by the Contractor. Division 26 shall advise the Contractor as to size, location and details of curbs required.
- F. The Contractor shall furnish all foundations and supports required for electrical equipment. Division 26 shall furnish an approved layout of bases and supports to the Contractor.
- G. In general, all floor-mounted equipment shall be installed on raised concrete bases. Concrete bases shall be not less than 6 inches high unless otherwise noted, and shall be poured in forms built of new dressed lumber. Foundation corners shall be neatly chamfered by means of sheet metal or triangular wood strips nailed to the form. Foundation bolts shall be placed in forms when concrete is poured; bolts shall be correctly located by means of templates. Allow 1 inch below equipment bases for alignment and grouting. After grouting, the forms will be removed and the surface of the foundations shall be hand-rubbed with carborundum.
- H. Division 26 shall give full cooperation to other trades, furnishing, in writing, to the Architect Engineer, any information necessary to permit work of all trades to be installed satisfactorily and with the least possible interference or delay.
- I. Where work of this Division will be installed close to work of other trades, or where there is evidence that the work will interfere with work of other trades, the Division 26 shall assist in working out space conditions to make satisfactory adjustment. If the Contractor installs work before coordinating with other trades, he shall make necessary changes in his work to correct the condition without extra charge.
- J. Keep work area clean at all times. Daily remove all scraps and debris from work area.

#### **1.04 PERMITS AND INSPECTIONS**

- A. Give all necessary notices; obtain all permits, and pay all governmental taxes, fees and other costs in connection with work; file all necessary plans; prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain required certificates of inspection for his work and deliver same to the Architect Engineer before request for acceptance and final payment of work.
- B. Contractor shall include in the work, without extra cost to the Owner, all labor, materials, services, apparatus, drawings, etc. in order to comply with all laws, ordinances, rules and regulations, whether or not shown on the drawings and/or in the specifications.

#### **1.05 CODES AND STANDARDS**

- A. The following specifications and standards, of issues listed below, but referred to thereafter by basic designation only, form part of these specifications:
  - 1. National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Amendments and Supplements.
  - 2. National Electrical Safety Code.
  - 3. National Fire Protection Association's Recommended Practices.
  - 4. Local, City and State Codes and Ordinances.
  - 5. Underwriters Laboratories, Inc.
  - 6. Illuminating Engineering Society.
  - 7. Institute of Electrical and Electronic Engineers.
  - 8. Insulated Cable Engineers Association.
  - 9. National Electrical Manufacturers Association.
  - 10. American National Standards Institute.
  - 11. American Society for Testing Materials.
  - 12. State Fire Prevention Code.
  - 13. Occupational Health Safety Act.
  - 14. National Electrical Contractor Standards..
- B. The latest specifications and standards available shall be used for the above.

#### **1.06 REVIEW OF MATERIALS**

- A. It is the intent of these specifications to establish quality standards of materials and equipment installed. Therefore, specific items are identified by manufacturer, trade name or catalog designation.
- B. Should the Contractor propose to furnish material and equipment other than that specified, he shall submit a written request for any or all substitutions to the Architect Engineer. Such request shall be alternatives to the original bid, and shall be submitted complete with descriptive (manufacturer, brand name, catalog number, etc.), and technical data for all items. The Contractor shall submit written answers to the following questions for each substitution request:
  - 1. Is the substitution of equal, greater or less quality than the design requirements?
  - 2. If of less quality, what is the difference in value?
  - 3. If of equal or better quality, what are the advantages to the Owner in accepting the substitution at no change in contract price?
- C. Where such substitutions alter the design or space requirements indicated on the drawings, the Contractor shall include all items of cost for the revised design and include cost of all applicable trades involved.
- D. Acceptance or rejection of the proposed substitutions shall be subject to the approval of the Architect Engineer. If requested by the Architect Engineer, the Contractor shall submit for inspection samples of both the specified and proposed substitute items.
- E. In all cases where substitutions are permitted, the Contractor shall bear any extra cost of evaluating the equality of the material and the equipment to be installed.

- F. The Contractor shall submit to the Architect Engineer detailed dimensioned shop drawings covering all items of electrical equipment. No equipment should be put into manufacture or ordered until these shop drawings or brochures have been approved by the Architect Engineer.
- G. The Contractor shall submit 5 copies of the shop drawings to the Architect Engineer for comment or correction.
- H. In the event resubmittal is required, the Contractor shall revise the shop drawings as directed by the Architect Engineer. The Contractor shall then resubmit 5 copies of the corrected shop drawings to the Architect Engineer for final approval.
- I. As soon as practicable and within 30 days after award of contract, and before beginning fabrication of material or installation of equipment, the Contractor shall submit a complete schedule of materials, equipment, apparatus and appurtenances proposed for installation and/or use in this project to the Architect Engineer for approval.
- J. This schedule shall be in the form of a bill of materials and shall include manufacturer's names, catalog numbers, diagrams and other descriptive data as required for approval. Submittal procedure shall be the same as specified above.
- K. Upon completion of the project, this Contractor shall prepare and deliver to the Architect Engineer one set of red-lined "RECORD SET" prints, showing actual installed locations of all electrical conduits, ducts and cables outside and inside of the buildings, including the location of all underground junction boxes, pull boxes, handholes and manholes. Make all necessary field measurements during the installation of the electrical work.

#### **1.07 DEVIATIONS**

- A. The Drawings, which constitute an integral part of the contract, shall indicate the general layout of the complete electrical systems; arrangement of feeders, circuits, outlets, switches, controls, panelboards, transformers, unit substations, service equipment, fixtures and other work.
- B. Field verification of scale dimensions on the drawings is directed since actual locations, distances and levels will be governed by actual field conditions.
- C. The Contractor shall check architectural, structural, plumbing, heating and ventilating to avert possible installation conflicts. Should drastic changes from original drawings be necessary to resolve such conflicts, the Contractor shall notify the Architect Engineer and secure written approval and agreement on necessary adjustments before the installation is started.
- D. The drawings may be superseded by later revised or detailed drawings or specification addenda prepared by the Architect Engineer, and the Contractor shall conform to all reasonable changes without extra cost to the Owner. All items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation, shall be included.

#### **1.08 SITE UTILITIES**

- A. Locations and elevations of various utilities, included within the scope of this work, have been obtained from city and utility maps and/or other substantially reliable sources, and are offered separately from contract documents as a general guide only without guarantee as to accuracy. The Contractor shall examine the site and verify to his own satisfaction the locations and elevations of all utilities and shall adequately inform himself of their relations to the work before entering into contract.
- B. Voltage that appears on the drawings and elsewhere in these specifications has been obtained from the serving utility company. Before ordering equipment and starting the job, the Contractor shall verify the voltage with the utility company. If voltage differs from that noted on the drawings and in the specifications, the Architect Engineer shall be notified at once. If the Architect Engineer is not notified before equipment is ordered or construction is started, the Contractor shall provide an acceptable and operable system at no additional cost to the Owner.
- C. Exterior utilities shall include all conduit and appurtenances outside of the building or as shown on the plans. Unless otherwise noted, utilities shall include complete tie-in with utility lines at no extra cost to the Owner. The Contractor shall pay all costs required by utility company

pertaining to construction and tie-in. Deposits required for permanent service shall be paid by the Owner.

### **1.09 ELECTRICAL LICENSE REQUIREMENT**

- A. No person shall perform electrical work on the contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.
- B. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. Each item of equipment furnished under these specifications is to be essentially the standard product of the manufacturer; however, component parts of equipment need not be products of one manufacturer.
- B. All material and equipment shall be new and of the best quality normally used in good commercial practice, being products of reputable manufacture. Each major component shall bear a name plate stating name and address of the manufacturer and catalog number or designation. All materials shall be of the manufacturer's latest design standard, and bear Underwriters Laboratories, Inc. label and the manufacturer's trade mark.
- C. Where items of equipment and/or apparatus come under the following general headings; all of the equipment shall be from the same manufacturer:
  - 1. Busways, circuit breakers, load centers, metering equipment, panelboards, safety switches, starters, substations, switchboards and switchgear.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. All electrical construction work shall be installed under the direction of a competent supervisor who will be at the job site at all times when electrical installations are being made.
- B. Installing Contractor will be held responsible for damage to other work resulting from negligence of his workmen. Such repairs shall be performed by the trade originally accomplishing the work but at the expense of Division 26.
- C. The Contractor shall utilize only competent and skillful workmen in handling and installing equipment specified.
- D. Installation shall be carried out in such a manner that the many components will function as a complete workable system including any accessories required to accomplish such installation. Equipment shall be left properly adjusted and in satisfactory working order. Work is to be executed in conformity with best acceptable standard practices with the equipment being installed to allow for maximum accessibility and best appearance. Installation shall be such that future installations and expansions can be made with a minimum of expenditure.
- E. Where possible, work must be scheduled for accomplishment during periods acceptable to the Owner, but when such scheduling is not feasible, work shall be executed at night or over weekends. No additional compensation will be allowed for overtime.
- F. Apparatus which is too large to permit access through stairways, doorways or shafts shall be brought to the job site by the Contractor involved and put in place before the closing of the structure.
- G. Division 26 shall be responsible for the protection of electrical apparatus from damage and the elements. This shall include the erection of temporary shelters, cribbing, and the covering of apparatus in uncompleted areas of buildings with tarpaulins. Failure to comply with the foregoing by the Contractor to the satisfaction of the Architect Engineer will be sufficient cause for rejection of the piece of apparatus in question.



- H. Chases, recesses, and other openings required for the location of conduits or equipment in new construction shall be provided by the Contractor. Division 26 shall advise the Contractor of the size and locations, and furnish all necessary drawings required for his work in sufficient time to allow for provision of chase.
- I. After installation is complete, and at such time as the Architect Engineer may direct, the Contractor shall conduct an operating test for approval. Equipment shall be demonstrated to operate in accordance with the requirements of this specification. Test shall be performed in the presence of the Architect Engineer or authorized representative. Division 26 shall furnish instruments and personnel required for the test and Owner will furnish necessary electrical power.
- J. The Contractor shall furnish a written certificate guaranteeing materials, equipment and labor furnished to be free of defects for a period of 1 year; except where otherwise indicated, from and after the date of final acceptance of the work by the Owner, and further agrees that if defects appear within stipulated guaranty period same shall be replaced or made good without charge.

### **3.02 SEISMIC QUALIFICATION OF EQUIPMENT**

- A. Provide manufacturer's certificate of compliance for the following equipment requiring seismic qualification in accordance with ASCE-7.
  - 1. Transformers
  - 2. Panel Boards
  - 3. Circuit Breakers
  - 4. Motor Starters
  - 5. Switch Boards
  - 6. Light Fixtures

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 26 05 01**  
**MINOR ELECTRICAL DEMOLITION**

**PART 1 GENERAL - NOT USED**

**1.01 SECTION INCLUDES**

- A. Electrical demolition.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 70 00 - Execution and Closeout Requirements: Additional requirements for alterations work.

**PART 2 PRODUCTS - NOT USED**

**2.01 MATERIALS AND EQUIPMENT**

- A. Materials and equipment for patching and extending work: As specified in individual sections.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Architect Engineer before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

**3.02 PREPARATION**

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company and Owner.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
  - 1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
  - 2. Make temporary connections to maintain service in areas adjacent to work area.

**3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
  - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
  - 2. PCB- and DEHP-containing lighting ballasts.
  - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- I. Repair adjacent construction and finishes damaged during demolition and extension work.
- J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

**3.04 CLEANING AND REPAIR**

- A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

**END OF SECTION**

**SECTION 26 05 19**

**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Service entrance cable.
- C. Metal-clad cable.
- D. Wiring connectors.
- E. Electrical tape.
- F. Heat shrink tubing.
- G. Wire pulling lubricant.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010.
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2009).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); National Electrical Contractors Association; 2006.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association; 2009 (ANSI/NEMA WC 70/ICEA S-95-658).
- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- K. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

- Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- R. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
- S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

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

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

#### **1.08 FIELD CONDITIONS**

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect Engineer and obtain direction before proceeding with work.

### **PART 2 PRODUCTS**

#### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:
    - a. For overhead service drop, installed in raceway to service head.
    - b. For underground service entrance, installed in raceway.
  - 2. In addition to other applicable restrictions, may not be used:
    - a. Where exposed to damage.
- F. Armored cable is not permitted.
- G. Metal-clad cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:

- a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
  - 1) Maximum Length: 6 feet.
- b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.
  - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
2. In addition to other applicable restrictions, may not be used:
  - a. Where not approved for use by the authority having jurisdiction.
  - b. Where exposed to view.
  - c. Where exposed to damage.
  - d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
  - e. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
- H. Manufactured wiring systems are not permitted.

## 2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- I. Conductor Material:
  1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
  3. Tinned Copper Conductors: Comply with ASTM B33.
- J. Minimum Conductor Size:
  1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
  2. Control Circuits: 14 AWG.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. Conductor Color Coding:
  1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  3. Color Code:
    - a. 208Y/120 V, 3 Phase, 4 Wire System:

- 1) Phase A: Black.
- 2) Phase B: Red.
- 3) Phase C: Blue.
- 4) Neutral/Grounded: White.
- b. Equipment Ground, All Systems: Green.
- c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
- d. For control circuits, comply with manufacturer's recommended color code.

### **2.03 SINGLE CONDUCTOR BUILDING WIRE**

- A. Manufacturers:
  1. Copper Building Wire:
    - a. Cerro Wire LLC: [www.cerrowire.com](http://www.cerrowire.com).
    - b. Encore Wire Corporation: [www.encorewire.com](http://www.encorewire.com).
    - c. Southwire Company: [www.southwire.com](http://www.southwire.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
  1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
  2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
  1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Size 4 AWG and Larger: Type XHHW-2.
    - b. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

### **2.04 SERVICE ENTRANCE CABLE**

- A. Manufacturers:
  1. Copper Service Entrance Cable:
    - a. Cerro Wire LLC: [www.cerrowire.com](http://www.cerrowire.com).
    - b. Encore Wire Corporation: [www.encorewire.com](http://www.encorewire.com).
    - c. Southwire Company: [www.southwire.com](http://www.southwire.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.
- C. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44, Type RHH/RHW-2.
- D. Conductor Stranding: Stranded.
- E. Insulation Voltage Rating: 600 V.

### **2.05 METAL-CLAD CABLE**

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
  1. Size 10 AWG and Smaller: Solid.
  2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.



- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.
- G. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

## **2.06 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  - 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
  - 6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
  - 7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

## **2.07 WIRING ACCESSORIES**

- A. Electrical Tape:
  - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
  - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
  4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
  5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
  6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
1. Manufacturers:
    - a. 3M: [www.3m.com](http://www.3m.com).
    - b. American Polywater Corporation: [www.polywater.com](http://www.polywater.com).
    - c. Ideal Industries, Inc: [www.idealindustries.com](http://www.idealindustries.com).
    - d. \_\_\_\_\_.
    - e. Substitutions: See Section 01 60 00 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as shown on the drawings.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

#### **3.03 INSTALLATION**

- A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
  2. When circuit destination is indicated and routing is not shown, determine exact routing required.
  3. Arrange circuiting to minimize splices.
  4. Include circuit lengths required to install connected devices within 10 ft of location shown.
  5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is not permitted.
  8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.

- E. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Exposed Cable Installation (only where specifically permitted):
  - 1. Route cables parallel or perpendicular to building structural members and surfaces.
  - 2. Protect cables from physical damage.
- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
  - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
  - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- I. Terminate cables using suitable fittings.
  - 1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- J. Install conductors with a minimum of 12 inches of slack at each outlet.
- K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- N. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

- b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
- 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
  - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
  - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- 3. Wet Locations: Use heat shrink tubing.
- P. Insulate ends of spare conductors using vinyl insulating electrical tape.
- Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- R. Identify conductors and cables in accordance with Section 26 05 53.
- S. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- T. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

#### **3.04 FIELD QUALITY CONTROL**

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
  - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

**SECTION 26 05 26**

**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Ground plate electrodes.
- G. Ground access wells.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
  - 1. Includes oxide inhibiting compound.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; National Electrical Manufacturers Association; 2007.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 99 - Health Care Facilities Code; National Fire Protection Association; 2012.
- G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 3. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Field quality control test reports.
- E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
  - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- F. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  - 2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
  - 3. Metal Building or Structure Frame:

- a. Provide connection to metal building or structure frame effectively grounded in accordance with NFPA 70 at nearest accessible location.
4. Concrete-Encased Electrode:
  - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Ring:
  - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
  - b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
  - c. Provide connection from ground ring conductor to:
    - 1) Perimeter columns of metal building frame.
    - 2) Ground rod electrodes located as indicated.
6. Ground Rod Electrode(s):
  - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
  - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
  - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
  - d. Provide ground access well for each electrode.
7. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
8. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
  - a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
  - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
  - c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
9. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.
- G. Service-Supplied System Grounding:
  1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
  2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
  1. Provide grounding electrode system for each separate building or structure.
  2. Provide equipment grounding conductor routed with supply conductors.
  3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
  4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- I. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:
    - a. Transformers (except autotransformers such as buck-boost transformers).
    - b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
    - c. Generators, when neutral is switched in the transfer switch.
  2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
  3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
  4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
  5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
  6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
  7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- J. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    - b. Metal gas piping.
    - c. \_\_\_\_\_.
  8. Provide bonding for interior metal air ducts.
  9. Provide bonding for metal building frame where not used as a grounding electrode.
  10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
  11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
  12. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.



- K. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
  2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    - b. Raceway Size: 3/4 inch unless otherwise indicated or required.
    - c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
    - d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

## 2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 05 19:
1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
  2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.
- C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
    - a. Exceptions:
      - 1) Use mechanical connectors for connections to electrodes at ground access wells.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
    - a. Exceptions:
      - 1) Use exothermic welded connections for connections to metal building frame.
  4. Manufacturers - Mechanical and Compression Connectors:
    - a. Burndy: [www.burndy.com](http://www.burndy.com).
    - b. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  5. Manufacturers - Exothermic Welded Connections:
    - a. Burndy: [www.burndy.com](http://www.burndy.com).
    - b. Cadweld, a brand of Erico International Corporation: [www.erico.com](http://www.erico.com).
    - c. ThermOweld, a brand of Continental Industries, Inc: [www.thermoweld.com](http://www.thermoweld.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  2. Size: As indicated.
  3. Holes for Connections: As indicated or as required for connections to be made.
  4. Manufacturers:
    - a. Erico International Corporation: [www.erico.com](http://www.erico.com).
    - b. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com).

- c. ThermOweld, a brand of Continental Industries, Inc: [www.thermoweld.com](http://www.thermoweld.com).
  - d. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Ground Rod Electrodes:
- 1. Comply with NEMA GR 1.
  - 2. Material: Copper-bonded (copper-clad) steel.
  - 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
  - 4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
  - 5. Manufacturers:
    - a. Erico International Corporation: [www.erico.com](http://www.erico.com).
    - b. Galvan Industries, Inc: [www.galvanelectrical.com](http://www.galvanelectrical.com).
    - c. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Ground Plate Electrodes:
- 1. Material: Copper.
  - 2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
  - 3. Manufacturers:
    - a. Erico International Corporation: [www.erico.com](http://www.erico.com).
    - b. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com).
    - c. ThermOweld, a brand of Continental Industries, Inc: [www.thermoweld.com](http://www.thermoweld.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Ground Access Wells:
- 1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
  - 2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
    - a. Round Wells: Not less than 8 inches in diameter.
    - b. Rectangular Wells: Not less than 12 by 12 inches.
  - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
  - 4. Cover: Factory-identified by permanent means with word "GROUND".
  - 5. Manufacturers:
    - a. Erico International Corporation: [www.erico.com](http://www.erico.com).
    - b. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com).
    - c. ThermOweld, a brand of Continental Industries, Inc: [www.thermoweld.com](http://www.thermoweld.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Oxide Inhibiting Compound: Comply with Section 26 05 19.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as shown on the drawings.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury

horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
- D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.
- E. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- F. Identify grounding and bonding system components in accordance with Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 26 05 29**

**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 26 05 34 - Conduit: Additional support and attachment requirements for conduits.
- D. Section 26 05 37 - Boxes: Additional support and attachment requirements for boxes.
- E. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- F. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.
- D. MFMA-4 - Metal Framing Standards Publication; Metal Framing Manufacturers Association; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

**1.05 SUBMITTALS**

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

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- E. Installer's Qualifications: Include evidence of compliance with specified requirements.
- F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Installer Qualifications for Field-Welding: As specified in Section 05 50 00.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
  - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
  - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
  - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
- C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
  - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  - 2. Conduit Clamps: Bolted type unless otherwise indicated.
  - 3. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com).
    - b. Erico International Corporation: [www.erico.com](http://www.erico.com).

- c. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
  - d. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
  - e. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- 1. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com).
    - b. Erico International Corporation: [www.erico.com](http://www.erico.com).
    - c. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - d. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
- 1. Comply with MFMA-4.
  - 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
  - 3. Channel Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
  - 4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
  - 5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
  - 6. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com).
    - b. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - c. Unistrut, a brand of Atkore International Inc: [www.unistrut.com](http://www.unistrut.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
    - e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- 1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Busway Supports: 1/2 inch diameter.
    - c. Single Conduit up to 1 inch (27mm) trade size: 1/4 inch diameter.
    - d. Single Conduit larger than 1 inch (27mm) trade size: 3/8 inch diameter.
    - e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
    - f. Outlet Boxes: 1/4 inch diameter.
    - g. Luminaires: 1/4 inch diameter.
- G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
- 1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  - 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
  - 3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
  - 4. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com).
    - b. Erico International Corporation: [www.erico.com](http://www.erico.com).
    - c. PHP Systems/Design: [www.phpsd.com](http://www.phpsd.com).
    - d. Unistrut, a brand of Atkore International Inc: [www.unistrut.com](http://www.unistrut.com).

- e. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  - 4. Hollow Masonry: Use toggle bolts.
  - 5. Hollow Stud Walls: Use toggle bolts.
  - 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
  - 7. Sheet Metal: Use sheet metal screws.
  - 8. Wood: Use wood screws.
  - 9. Plastic and lead anchors are not permitted.
  - 10. Powder-actuated fasteners are not permitted.
  - 11. Hammer-driven anchors and fasteners are not permitted.
  - 12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Comply with MFMA-4.
    - b. Channel Material: Use galvanized steel.
    - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
    - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
  - 13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
  - 14. Manufacturers - Mechanical Anchors:
    - a. Hilti, Inc: [www.us.hilti.com](http://www.us.hilti.com).
    - b. ITW Red Head, a division of Illinois Tool Works, Inc: [www.itwredhead.com](http://www.itwredhead.com).
    - c. Powers Fasteners, Inc: [www.powers.com](http://www.powers.com).
    - d. Simpson Strong-Tie Company Inc: [www.strongtie.com](http://www.strongtie.com).
    - e. Substitutions: See Section 01 60 00 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect Engineer, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect Engineer, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:



1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Conduit Support and Attachment: Also comply with Section 26 05 34.
- J. Box Support and Attachment: Also comply with Section 26 05 37.
- K. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.
- L. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00.
- M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- N. Secure fasteners according to manufacturer's recommended torque settings.
- O. Remove temporary supports.
- P. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 26 05 34**

**CONDUIT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Rigid polyvinyl chloride (PVC) conduit.
- G. Conduit fittings.
- H. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 07 84 00 - Firestopping.
- C. Section 22 05 48 - Vibration Isolation and Seismic Control (For Seismic Bracing of Conduit, Equipment and Boxes)
- D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 1. Includes additional requirements for fittings for grounding and bonding.
- E. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

**1.03 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); National Electrical Contractors Association; 2003.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association; 2005.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; National Electrical Manufacturers Association; 2013.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2013.

- K. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- N. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- P. UL 651 - Schedule 40 and 80 Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- R. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
  - 5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Shop Drawings:
  - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
  - 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Multi-trade Coordination: In lieu of detailed shop drawings, the Contractor may conduct a pre-installation and coordination meeting, with follow-up meetings to coordinate routing of mechanical, fire protection and electrical elements. Locations and conflict resolutions shall be made during these meetings. Notify Architect-Engineer of meeting times and dates. Do not install any conduit until this meeting has taken place.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
  - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
  - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
  - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
  - 5. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
  - 6. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Embedded Within Concrete:
  - 1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
  - 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
  - 3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
  - 1. Locations subject to physical damage include, but are not limited to:
    - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
    - b. Where exposed below 20 feet in warehouse areas.
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit or PVC-coated galvanized steel rigid metal conduit.

- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- M. Connections to Vibrating Equipment:
  - 1. Dry Locations: Use flexible metal conduit.
  - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
  - 3. Maximum Length: 6 feet unless otherwise indicated.
  - 4. Vibrating equipment includes, but is not limited to:
    - a. Transformers.
    - b. Motors.
- N. Panelboard feeders: Use galvanized steel rigid metal conduit.
- O. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

## 2.02 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Electrical Service Conduits: Also comply with Section 26 21 00.
- C. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.
- D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for the purpose intended.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
  - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
  - 3. Control Circuits: 1/2 inch (16 mm) trade size.
  - 4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
  - 5. Underground, Interior: 1 inch (27 mm) trade size.
  - 6. Underground, Exterior: 1 inch (27 mm) trade size.
- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## 2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
  - 1. Allied Tube & Conduit: [www.alliedeg.com](http://www.alliedeg.com).
  - 2. Republic Conduit: [www.republic-conduit.com](http://www.republic-conduit.com).
  - 3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
  - 1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com](http://www.bptfittings.com).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
  - 4. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

#### **2.04 INTERMEDIATE METAL CONDUIT (IMC)**

- A. Manufacturers:
  1. Allied Tube & Conduit: [www.alliedeg.com](http://www.alliedeg.com).
  2. Republic Conduit: [www.republic-conduit.com](http://www.republic-conduit.com).
  3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com](http://www.bptfittings.com).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
  4. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.
  6. More than Five Feet from Foundation Wall:
    - a. In Dirt: Use rigid steel conduit.
    - b. Under Road: Use rigid steel conduit.
- D. Slab Penetrations:
  1. Vertical penetrations: Use rigid steel conduit.
  2. Elbows: Use rigid steel conduit.
- E. Motor and other moving equipment connections:
  1. Dry locations: Flexible steel conduit.
  2. Damp locations: Liquid-tight flexible steel conduit.

#### **2.05 FLEXIBLE METAL CONDUIT (FMC)**

- A. Manufacturers:
  1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).
  2. Flex Tubes: [www.flex-tubes.com](http://www.flex-tubes.com)
  3. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com).
  4. International Metal Hose: [www.metalhose.com](http://www.metalhose.com).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com](http://www.bptfittings.com).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
  - a. Do not use die cast zinc fittings.

#### **2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Manufacturers:
  1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).
  2. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com).
  3. International Metal Hose: [www.metalhose.com](http://www.metalhose.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com](http://www.bptfittings.com).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

#### **2.07 ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  1. Allied Tube & Conduit: [www.alliedeg.com](http://www.alliedeg.com).
  2. Republic Conduit: [www.republic-conduit.com](http://www.republic-conduit.com).
  3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com](http://www.bptfittings.com).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  4. Connectors and Couplings: Use compression (gland) or set-screw type.
    - a. Do not use indenter type connectors and couplings.
  5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

#### **2.08 NONMETALLIC CONDUIT**

- A. Manufacturers:
  1. Cantex Inc: [www.cantexinc.com](http://www.cantexinc.com).
  2. Carlon, a brand of Thomas & Betts Corporation: [www.carlon.com](http://www.carlon.com).
  3. JM Eagle: [www.jmeagle.com](http://www.jmeagle.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.



- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
  - 1. Manufacturer: Same as manufacturer of conduit to be connected.
  - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

## **2.09 ACCESSORIES**

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- G. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated and routing is not shown, determine exact routing required.
  - 3. Conceal all conduits unless specifically indicated to be exposed.
  - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
  - 5. Unless otherwise approved, do not route conduits exposed:
    - a. Across floors.
    - b. Across roofs.
    - c. Across top of parapet walls.
    - d. Across building exterior surfaces.
  - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.
  8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
  9. Arrange conduit to provide no more than 150 feet between pull points.
  10. Route conduits above water and drain piping where possible.
  11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
  13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    - a. Heaters.
    - b. Hot water piping.
    - c. Flues.
  14. Group parallel conduits in the same area together on a common rack.
- H. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  4. Use conduit strap to support single surface-mounted conduit.
    - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
  5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
  6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
  7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
  8. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
  7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.
  5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
  6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
  7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
  9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
  10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- K. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
    - a. Underground, Exterior: 24 inches.
    - b. Under Slab on Grade: 12 inches to bottom of slab.
  2. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.
- L. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Include proposed conduit arrangement with submittals.
  2. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
  3. Secure conduits to prevent floating or movement during pouring of concrete.
- M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.
- N. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- O. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
  3. Where conduits are subject to earth movement by settlement or frost.
- P. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
  3. Where conduits penetrate coolers or freezers.
- Q. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- R. Provide grounding and bonding in accordance with Section 26 05 26.
- S. Identify conduits in accordance with Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

**3.04 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

**3.05 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

**SECTION 26 05 35**  
**SURFACE RACEWAYS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface raceway systems.
- B. Wireways.
- C. Wall duct.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 34 - Conduit.
- D. Section 26 05 37 - Boxes.
- E. Section 26 27 26 - Wiring Devices: Receptacles.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- D. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.
- E. UL 5A - Nonmetallic Surface Raceways and Fittings; Current Edition, Including All Revisions.
- F. UL 111 - Outline of Investigation for Multioutlet Assemblies; Current Edition, Including All Revisions.
- G. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate rough-in locations of outlet boxes provided under Section 26 05 37 and conduit provided under Section 26 05 34 as required for installation of raceways provided under this section.
  - 3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
  - 4. Wall Duct: Coordinate the work with other trades to provide walls suitable for installation of flush-mounted wall duct where indicated.
  - 5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install raceways until final surface finishes and painting are complete.
  - 2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

**1.05 SUBMITTALS**

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

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
  - 1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 RACEWAY REQUIREMENTS**

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

#### **2.02 SURFACE RACEWAY SYSTEMS**

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. MonoSystems, Inc: [www.monosystems.com](http://www.monosystems.com).
  - 3. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Surface Metal Raceways: Listed and labeled as complying with UL 5.
- C. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.
- D. Multioutlet Assemblies: Listed and labeled as complying with UL 111.

#### **2.03 WIREWAYS**

- A. Manufacturers:
  - 1. Cooper B-Line, a division of Cooper Industries: [www.cooperindustries.com](http://www.cooperindustries.com).
  - 2. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com](http://www.hoffmanonline.com).
  - 3. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.
- C. Wireway Type, Unless Otherwise Indicated:
  - 1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.
- D. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.
- E. Minimum Wireway Size: 2.5 by 2.5 inches unless otherwise indicated.
- F. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

#### **2.04 WALL DUCT**

- A. Manufacturers:
  - 1. Dennis Filges Company, Inc: [www.filgesco.com](http://www.filgesco.com).
  - 2. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
  - 3. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Metal raceways specifically designed for enclosure of wiring to X-ray machines and similar medical equipment; listed and labeled as complying with UL 870.

- C. Material: Steel, unless otherwise indicated.
- D. Mounting Provisions: Suitable for surface- or flush-mounting as indicated.
- E. Size: As indicated on the drawings.

## **2.05 SOURCE QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Factory test each production unit for pre-wired surface raceway systems to verify proper wiring.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.
- C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install raceways in a neat and workmanlike manner in accordance with NECA 1.
- C. Install raceways plumb and level.
- D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.
- E. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.
- F. Close unused raceway openings.
- G. Provide grounding and bonding in accordance with Section 26 05 26.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect raceways for damage and defects.
- C. Surface Raceway Systems with Integrated Devices: Test each wiring device to verify operation and proper polarity.
- D. Correct wiring deficiencies and replace damaged or defective raceways.

### **3.04 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.05 PROTECTION**

- A. Protect installed raceways from subsequent construction operations.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 26 05 37**  
**BOXES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 34 - Conduit:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- F. Section 26 27 26 - Wiring Devices:
  - 1. Wall plates.
  - 2. Additional requirements for locating boxes for wiring devices.
- G. Section 23 05 48 - Heating, Ventilation and Air-Conditioning (HVAC) Vibration Isolation And Seismic Restraint.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008 (Revised 2010) (ANSI/NEMA OS 1).
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2008 (Revised 2010) (ANSI/NEMA OS 2).
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
  - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
  - 6. Coordinate the work with other trades to preserve insulation integrity.
  - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
  - 8. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
- C. Project Record Documents: Record actual locations for pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70 (NEC).

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 BOXES**

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
  - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  - 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
  - 4. Use nonmetallic boxes where exposed rigid PVC conduit is used.
  - 5. Use suitable concrete type boxes where flush-mounted in concrete.

6. Use suitable masonry type boxes where flush-mounted in masonry walls.
  7. Use raised covers suitable for the type of wall construction and device configuration where required.
  8. Use shallow boxes where required by the type of wall construction.
  9. Do not use "through-wall" boxes designed for access from both sides of wall.
  10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  12. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
  13. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  14. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
  15. Minimum Box Size, Unless Otherwise Indicated:
    - a. Wiring Devices: 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    - b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
  16. Wall Plates: Comply with Section 26 27 26.
  17. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com).
    - b. Hubbell Incorporated; Bell Products: [www.hubbell-bell.com](http://www.hubbell-bell.com).
    - c. Hubbell Incorporated; RACO Products: [www.hubbell-raco.com](http://www.hubbell-raco.com).
    - d. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - e. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - f. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
  4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
  5. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation: [www.cooperindustries.com](http://www.cooperindustries.com).
    - b. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com](http://www.hoffmanonline.com).
    - c. Hubbell Incorporated; Wiegmann Products: [www.hubbell-wiegmann.com](http://www.hubbell-wiegmann.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.

- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- G. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
  - 4. Locate boxes so that wall plates do not span different building finishes.
  - 5. Locate boxes so that wall plates do not cross masonry joints.
  - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  - 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
  - 9. Fire-Resistance-Rated Walls: Install flush-mounted boxes such that the required fire-resistance will not be reduced.
    - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
  - 10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 34.
  - 11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
    - b. Within joists in areas with no ceiling.
    - c. Electrical rooms.
    - d. Mechanical equipment rooms.
- H. Box Supports:
  - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  - 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- I. Install boxes plumb and level.

- J. Flush-Mounted Boxes:
  - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- K. Install boxes as required to preserve insulation integrity.
- L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- N. Close unused box openings.
- O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- P. Provide grounding and bonding in accordance with Section 26 05 26.
- Q. Do not mount boxes back-to-back.

### **3.03 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

### **3.04 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 26 05 53**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Conduit and raceway markers.
- E. Floor marking tape.
- F. Warning signs and labels.
- G. Warning label and signs.
- H. Underground line warning tapes.
- I. Instruction signs.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 90 00 - Painting and Coating.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.
- C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions and graphic features of identification products.
- D. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of the National Electrical Code - NFPA 70 (NEC).

### 1.07 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

## PART 2 PRODUCTS

### 2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Panelboards:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.
      - 3) Identify power source and circuit number. Include location when not within sight of equipment.
      - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
      - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
  - 2. Emergency System Equipment:
    - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
    - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
    - c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
  - 3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
  - 4. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
  - 5. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
  - 6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
  - 7. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
  - 8. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
  - 9. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
  - 10. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
    - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 90 00.
  - 11. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    - a. Minimum Size: 3.5 by 5 inches.



- b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
  12. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
  13. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
  14. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
  15. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
  3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

## 2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
1. Materials:
    - a. Indoor Clean, Dry Locations: Use plastic nameplates.
    - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
  2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
    - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
  3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
  4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
  5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
1. Manufacturers:
    - a. Brady Corporation: [www.bradyid.com](http://www.bradyid.com).
    - b. Brother International Corporation: [www.brother-usa.com](http://www.brother-usa.com).
    - c. Panduit Corp: [www.panduit.com](http://www.panduit.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
    - a. Use only for indoor locations.

3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
  2. Legend:
    - a. System designation where applicable:
      - 1) Emergency Power System: Identify with text "EMERGENCY".
      - 2) Fire Alarm System: Identify with text "FIRE ALARM".
    - b. Equipment designation or other approved description.
    - c. Other information as indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height:
    - a. System Designation: 1 inch.
    - b. Equipment Designation: 1/2 inch.
    - c. Other Information: 1/4 inch.
  5. Color:
    - a. Normal Power System: White text on black background.
    - b. Emergency Power System: White text on red background.
    - c. Fire Alarm System: White text on red background.
- D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch by 2.5 inches.
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/4 inch.
  5. Color: Black text on white background unless otherwise indicated.
    - a. Exceptions:
      - 1) Provide white text on red background for general information or operational instructions for emergency systems.
      - 2) Provide white text on red background for general information or operational instructions for fire alarm systems.
- E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/2 inch.
  5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Designation indicated and device zone or address.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Red text on white background.
- G. Nameplate Inscription:
1. Nameplates must adequately describe the function or use of the particular equipment to which it is attached. Where nameplates are detailed on the drawings, inscription and size of letters shall be as shown. Nameplates for panelboards and switchboards shall include the panel designation, voltage and phase of the supply. Example: "Panel A, 277/480 v, 3-phase, 4-wire".
  2. The name of the machine on the motor nameplates for a particular machine shall be the same as the one used on all motor starters, disconnect and PB station nameplates for that machine.

3. Use 1-7/8 inch letters for identifying signs on enclosures containing high voltage equipment. Signs shall read "DANGER - HIGH VOLTAGE".
4. Warning signs (items 3 & 4 above) to be of standard manufacture, fabricated of 18 ga. steel, or heavier, with a porcelain enamel finish. Letters shall be red on white background.

### **2.03 WIRE AND CABLE MARKERS**

- A. Manufacturers:
  1. Brady Corporation: [www.bradyid.com](http://www.bradyid.com).
  2. HellermannTyton: [www.hellermanntyton.com](http://www.hellermanntyton.com).
  3. Panduit Corp: [www.panduit.com](http://www.panduit.com).
  4. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

### **2.04 VOLTAGE MARKERS**

- A. Manufacturers:
  1. Brady Corporation: [www.bradyid.com](http://www.bradyid.com).
  2. Brimar Industries, Inc: [www.brimar.com](http://www.brimar.com).
  3. Seton Identification Products: [www.seton.com](http://www.seton.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
  1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
- E. Legend:
  1. Markers for Voltage Identification: Highest voltage present.
- F. Color: Black text on orange background unless otherwise indicated.

### **2.05 FLOOR MARKING TAPE**

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches wide, with alternating black and white stripes.

### **2.06 WARNING SIGNS AND LABELS**

- A. Manufacturers:
  1. Brimar Industries, Inc: [www.brimar.com](http://www.brimar.com).
  2. Clarion Safety Systems, LLC: [www.clarionsafety.com](http://www.clarionsafety.com).
  3. Seton Identification Products: [www.seton.com](http://www.seton.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
  1. Materials:

- a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
  - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
  2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
  3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
    - a. Do not use labels designed to be completed using handwritten text.
  2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  3. Minimum Size: 2 by 4 inches unless otherwise indicated.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  1. Surface-Mounted Equipment: Enclosure front.
  2. Flush-Mounted Equipment: Inside of equipment door.
  3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  4. Elevated Equipment: Legible from the floor or working platform.
  5. Branch Devices: Adjacent to device.
  6. Interior Components: Legible from the point of access.
  7. Boxes: Outside face of cover.
  8. Conductors and Cables: Legible from the point of access.
  9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Secure rigid signs using stainless steel screws.
- G. Mark all handwritten text, where permitted, to be neat and legible.

#### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.
- C. Install wire, cable and underground markers per manufacturers' instructions.
- D. Install conduit, raceway and instructions signs parallel to lines and surrounding surfaces. Install instruction signs in a clearly visible location, straight and square to surroundings.

**END OF SECTION**

**SECTION 26 09 23**  
**LIGHTING CONTROL DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Occupancy sensors.
- B. Time switches.
- C. In-wall interval timers.
- D. Outdoor photo controls.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 37 - Boxes.
- B. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, fan speed controllers, and wall plates.
- C. Section 26 51 00 - Interior Lighting.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- E. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- F. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
  - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
  - 4. Notify Architect Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install lighting control devices until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
  - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
  - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
- D. Field Quality Control Reports.

- E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data: Include detailed information on device programming and setup.
- G. Project Record Documents: Record actual installed locations and settings for lighting control devices.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.

### **PART 2 PRODUCTS**

#### **2.01 ALL LIGHTING CONTROL DEVICES**

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
- C. Products for Switching of Electronic Fluorescent Ballasts: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

#### **2.02 OCCUPANCY SENSORS**

- A. Manufacturers:
  - 1. Hubbell Building Automation, Inc: [www.hubbellautomation.com](http://www.hubbellautomation.com)
  - 2. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com).
  - 3. Sensor Switch Inc: [www.sensorswitch.com](http://www.sensorswitch.com).
  - 4. WattStopper: [www.wattstopper.com](http://www.wattstopper.com).
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.
  - 6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. All Occupancy Sensors:
  - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  - 2. Sensor Technology:
    - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
    - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.

- c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
    - d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
  3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
  5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
  6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
  7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
  8. Sensitivity: Field adjustable.
  9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
  10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
  11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on the drawings.
  12. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
- C. Wall Switch Occupancy Sensors:
  1. All Wall Switch Occupancy Sensors:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
    - c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
    - d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    - e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
    - f. Provide selectable audible alert to notify occupant of impending load turn-off.
    - g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
  2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
  3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet.
  4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
- D. Ceiling Mounted Occupancy Sensors:
  1. All Ceiling Mounted Occupancy Sensors:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.

- b. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
- c. Provide field selectable setting for disabling LED motion detector visual indicator.
- d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
- e. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
  - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
  - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
  - a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
  - b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
  - c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
  - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
  - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
  - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
  - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet.
- E. Power Packs for Low Voltage Occupancy Sensors:
  1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
  2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.
  3. Input Supply Voltage: Dual rated for 120/277 V ac.
  4. Load Rating:
    - a. Incandescent Load: Not less than 15 A.
    - b. Fluorescent Load: Not less than 20 A.

### 2.03 TIME SWITCHES

- A. Manufacturers:
  1. Intermatic, Inc: [www.intermatic.com](http://www.intermatic.com).
  2. Paragon, a brand of Invensys Controls: [www.invensyscontrols.com](http://www.invensyscontrols.com).
  3. Tork, a division of NSI Industries LLC: [www.tork.com](http://www.tork.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
  5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Digital Electronic Time Switches:
  1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
  2. Program Capability:
    - a. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.



3. Schedule Capacity: Not less than 16 programmable on/off operations.
4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Provide remote photocell input with light level adjustment.
8. Input Supply Voltage: As indicated on the drawings.
9. Output Switch Contact Ratings:
  - a. Resistive Load: Not less than 30 A at 120-277 V ac.
  - b. Ballast Load: Not less than 30A.
10. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
  - a. Indoor clean, dry locations: Type 1.

#### **2.04 IN-WALL INTERVAL TIMERS**

- A. Manufacturers:
  1. Intermatic, Inc; \_\_\_\_\_: www.intermatic.com.
  2. Paragon, a brand of Invensys Controls; \_\_\_\_\_: www.invensyscontrols.com.
  3. Tork, a division of NSI Industries LLC; \_\_\_\_\_: www.tork.com.
  4. Substitutions: See Section 01 60 00 - Product Requirements.
  5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Digital Electronic In-Wall Interval Timers:
  1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
  2. Program Capability: Designed to turn load off at end of preset time interval.
  3. Time Interval: Field selectable range of presets available up to 12 hours.
  4. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.
  5. Provide power outage backup to retain programming and maintain clock.
  6. Manual override: Capable of both turning load off and resetting timer to original preset time interval.
  7. Switch Configuration: Suitable for use in either SPST or 3-way application.

#### **2.05 OUTDOOR PHOTO CONTROLS**

- A. Manufacturers:
  1. Intermatic, Inc: www.intermatic.com.
  2. Paragon, a brand of Invensys Controls: www.invensyscontrols.com.
  3. Tork, a division of NSI Industries LLC: www.tork.com.
  4. Substitutions: See Section 01 60 00 - Product Requirements.
  5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Stem-Mounted Outdoor Photo Controls:
  1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
  2. Housing: Weatherproof, impact resistant polycarbonate.
  3. Photo Sensor: Cadmium sulfide.
  4. Provide external sliding shield for field adjustment of light level activation.
  5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
  6. Voltage: As required to control the load indicated on the drawings.
  7. Failure Mode: Fails to the on position.
  8. Load Rating: As required to control the load indicated on the drawings.

9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.03 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of lighting control devices provided under this section.
  1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
    - b. In-Wall Time Switches: 48 inches above finished floor.
    - c. In-Wall Interval Timers: 48 inches above finished floor.
  2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
  3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect Engineer to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.
- G. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- H. Occupancy Sensor Locations:
  1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- I. Outdoor Photo Control Locations:
  1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
  2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
- J. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.
- K. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- L. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- M. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.
- N. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test time switches to verify proper operation.
- E. Test outdoor photo controls to verify proper operation, including time delays where applicable.
- F. Correct wiring deficiencies and replace damaged or defective lighting control devices.

### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect Engineer.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- D. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by. Record settings in written report to be included with submittals.
- E. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect Engineer.

### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.07 COMMISSIONING**

- A. See Section 01 91 13 for commissioning requirements.

### **3.08 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

- C. Demonstration: Demonstrate proper operation of lighting control devices to Architect Engineer, and correct deficiencies or make adjustments as directed.
- D. Training: Train 's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  - 2. Provide minimum of two hours of training.
  - 3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
  - 4. Location: At project site.

**END OF SECTION**

**SECTION 26 24 16**  
**PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- E. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- H. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- O. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
  1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
- D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Panelboard Keys: Two of each different key.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Siemens Industry, Inc: [www.usa.siemens.com](http://www.usa.siemens.com).
- B. Eaton Corporation; Cutler-Hammer Products: [www.eaton.com](http://www.eaton.com).
- C. General Electric Company: [www.geindustrial.com](http://www.geindustrial.com).
- D. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
- E. Substitutions: See Section 01 60 00 - Product Requirements.

- F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

## 2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. Listed series ratings are not acceptable.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
  - 3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
  - 4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
    - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
    - c. Provide painted steel boxes for surface-mounted panelboards, finish to match fronts.
  - 3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
  - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- L. Load centers are not acceptable.
- M. Provide the following features and accessories where indicated or where required to complete installation:

1. Feed-through lugs.
2. Sub-feed lugs.

### **2.03 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  1. Phase and Neutral Bus Material: Copper.
  2. Ground Bus Material: Copper.
- D. Circuit Breakers:
  1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
  2. Provide thermal magnetic circuit breakers unless otherwise indicated.
- E. Enclosures:
  1. Provide surface-mounted enclosures unless otherwise indicated.
  2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  3. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.04 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  2. Phase and Neutral Bus Material: Copper.
  3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  1. Provide surface-mounted or flush-mounted enclosures as indicated.
  2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  3. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.05 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded Case Circuit Breakers:
  1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      - 2) 14,000 rms symmetrical amperes at 480 VAC.



- b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
  - a. Provide mechanical lugs unless otherwise indicated.
  - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
  - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
  - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
  - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
  - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
8. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
9. Provide the following features and accessories where indicated or where required to complete installation:
  - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
  - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
  - c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
  - d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
  - e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

## **2.06 SOURCE QUALITY CONTROL**

- A. Factory test panelboards according to NEMA PB 1.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 05 29.
- E. Install panelboards plumb.
- F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- H. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- I. Provide grounding and bonding in accordance with Section 26 05 26.
  - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
  - 2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- J. Install all field-installed branch devices, components, and accessories.
- K. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- L. Provide filler plates to cover unused spaces in panelboards.
- M. Identify panelboards in accordance with Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
- D. Test GFCI circuit breakers to verify proper operation.
- E. Test AFCI circuit breakers to verify proper operation.
- F. Test shunt trips to verify proper operation.
- G. Correct deficiencies and replace damaged or defective panelboards or associated components.

### **3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

### **3.05 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 26 27 17**  
**EQUIPMENT WIRING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical connections to equipment.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 34 - Conduit.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).
- C. Section 26 05 37 - Boxes.
- D. Section 26 27 26 - Wiring Devices.

**1.03 REFERENCE STANDARDS**

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

**1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70 (NEC).
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Disconnect Switches: As specified in Division 23 and in individual equipment sections.
- B. Wiring Devices: As specified in Section 26 27 26.
- C. Flexible Conduit: As specified in Section 26 05 34.
- D. Wire and Cable: As specified in Section 26 05 19.
- E. Boxes: As specified in Section 26 05 37.

**2.02 EQUIPMENT CONNECTIONS**

- A. Coordinate Requirements with Division 23 (15):
  - 1. Electrical Connection: Flexible conduit.
  - 2. Provide field-installed disconnect switch where required.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

#### **3.02 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

**END OF SECTION**

**SECTION 26 27 26**  
**WIRING DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 37 - Boxes.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 27 17 - Equipment Wiring: Cords and plugs for equipment.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).
- E. NEMA WD 6 - Wiring Device -- Dimensional Specifications; National Electrical Manufacturers Association; 2002 (R2008).
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
  - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
  - 6. Notify Architect Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install wiring devices until final surface finishes and painting are complete.

### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Project Record Documents: Record actual installed locations of wiring devices.

### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70 (NEC).
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to authorities having jurisdiction as suitable for the purpose specified and indicated.

### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
- B. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
- C. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com).
- D. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- E. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Source Limitations: Where possible, for each type of wiring device furnish products produced by a single manufacturer and obtained from a single supplier.
- G. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

### **2.02 WIRING DEVICE APPLICATIONS**

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.
- D. Provide GFI protection for all receptacles installed within 6 feet of sinks.
- E. Provide GFI protection for all receptacles installed in kitchens.
- F. Provide GFI protection for all receptacles serving electric drinking fountains.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.

### **2.03 WIRING DEVICE FINISHES:**

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: Ivory with ivory nylon wall plate.

### **2.04 WALL SWITCHES**

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.

- B. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

## 2.05 RECEPTACLES

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
  - 3. Lutron Electronics Company, Inc; Designer Style: [www.lutron.com](http://www.lutron.com).
  - 4. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
  - 3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.
- C. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
- D. GFI Receptacles:
  - 1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
    - a. Provide test and reset buttons of same color as device.
  - 2. Standard GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  - 3. Weather Resistant GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

## 2.06 WALL PLATES

- A. Manufacturers:
  - 1. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
  - 3. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com).
  - 4. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
- B. All Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard.
  - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.

- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of wiring devices provided under this section.
  - 1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  - 2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  - 3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect Engineer to obtain direction prior to proceeding with work.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.



- O. Do not install devices back-to-back.

**3.04 FIELD QUALITY CONTROL**

- A. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

**3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

**3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 26 51 00**  
**INTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Fluorescent emergency power supply units.
- F. Lamps.
- G. Luminaire accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 37 - Boxes.
- B. Section 26 09 23 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
- C. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.
- D. Section 26 56 00 - Exterior Lighting.

**1.03 REFERENCE STANDARDS**

- A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.
- B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.
- C. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.
- D. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).
- E. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.
- F. IES LM-80 - Approved Method: Measuring Lumen Maintenance of LED Light Sources; Illuminating Engineering Society; 2008.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- H. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.
- I. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.
- J. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2011.
- K. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association; 2012.
- L. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. NFPA 101 - Life Safety Code; National Fire Protection Association; 2012.

- N. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- O. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- P. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
- Q. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- R. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
  - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
  - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
  - 4. Notify Architect Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
  - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.
  - 2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
  - 3. Fluorescent Emergency Power Supply Unit: Include list of compatible lamp configurations and associated lumen output.
- D. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
- G. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide two year manufacturer warranty for all linear fluorescent ballasts.
- C. Provide five year pro-rata warranty for batteries for emergency lighting units.
- D. Provide ten year pro-rata warranty for batteries for self-powered exit signs.
- E. Provide three year full warranty for fluorescent emergency power supply units.

#### **1.10 EXTRA MATERIALS**

- A. See Section 01 60 00 - Product Requirements, for additional provisions.
- B. Furnish two of each plastic lens type.
- C. Furnish one replacement lamps for each lamp type.
- D. Furnish two of each ballast type.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS - LUMINAIRES**

- A. Substitutions: See Section 01 60 00 - Product Requirements, except where individual luminaire types are designated with substitutions not permitted.

#### **2.02 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 01 60 00 - Product Requirements, except where individual luminaire types are designated with substitutions not permitted.

#### **2.03 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products that comply with requirements of NFPA 70 and NFPA 101.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Provide products complying with Federal Energy Management Program (FEMP) requirements.
- F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- I. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.
  2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
  3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- J. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.
- K. Fluorescent Luminaires:
1. Provide ballast disconnecting means complying with NFPA 70 where required.
  2. Fluorescent Luminaires Controlled by Occupancy Sensors: Provide programmed start ballasts.
  3. Fluorescent Luminaires Controlled by Dual-Level Switching: Provide with two ballasts.
    - a. Luminaires with Two Lamps: Each ballast controls one lamp.
    - b. Luminaires with Three Lamps: One ballast controls two outer lamps and one ballast controls inner lamp.
    - c. Luminaires with Four Lamps: One ballast controls two outer lamps and one ballast controls two inner lamps.
- L. LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
  2. Tested in accordance with IES LM-79 and IES LM-80.
  3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- M. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

#### **2.04 EMERGENCY LIGHTING UNITS**

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
1. Sealed maintenance-free lead calcium unless otherwise indicated.
  2. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

#### **2.05 FIXTURE TYPES**

#### **2.06 EXIT SIGNS**

- A. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
1. Number of Faces: Single or double as indicated or as required for the installed location.
  2. Directional Arrows: As indicated or as required for the installed location.
- B. Self-Powered Exit Signs:
1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
  2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.

3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
4. Provide low-voltage disconnect to prevent battery damage from deep discharge.

## 2.07 BALLASTS AND DRIVERS

- A. Manufacturers:
  1. General Electric Company/GE Lighting: [www.gelighting.com](http://www.gelighting.com).
  2. Osram Sylvania: [www.sylvania.com](http://www.sylvania.com).
  3. Philips Lighting Electronics/Advance: [www.advance.philips.com](http://www.advance.philips.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
  5. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
  6. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. All Ballasts:
  1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- C. Fluorescent Ballasts:
  1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
    - a. Inrush Current: Not exceeding peak currents specified in NEMA 410.
    - b. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
    - c. Total Harmonic Distortion: Not greater than 20 percent.
    - d. Power Factor: Not less than 0.95.
    - e. Ballast Factor: Normal ballast factor between 0.85 and 1.15, unless otherwise indicated.
    - f. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
    - g. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
    - h. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
    - i. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
    - j. Lamp Current Crest Factor: Not greater than 1.7.
    - k. Lamp Wiring Method:
      - 1) Instant Start Ballasts: Parallel wired.
      - 2) Rapid Start Ballasts: Series wired.
      - 3) Programmed Start Ballasts: Provide parallel or series/parallel wired where available; otherwise series wired is acceptable.
    - l. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
    - m. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.
    - n. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
    - o. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.
    - p. Provide high efficiency T8 lamp ballasts certified as NEMA premium where indicated.
    - q. Ballast Marking: Include wiring diagrams with lamp connections.
  2. Bi-Level Stepped Dimming Linear Fluorescent Ballasts:
    - a. Bi-Level Operation: Capable of being switched between full light output on all lamps, 50 percent of full light output on all lamps, and all lamps off.

- b. Control Compatibility: Capable of being controlled by standard manual light switches or occupancy sensors unless otherwise indicated.
- c. Lamp Starting Method: Programmed start unless otherwise indicated.

## 2.08 FLUORESCENT EMERGENCY POWER SUPPLY UNITS

- A. Manufacturers:
  - 1. Philips Emergency Lighting/Bodine: [www.bodine.com](http://www.bodine.com).
  - 2. Substitutions: See Section 01 60 00 - Product Requirements.
  - 3. Manufacturer Limitations: Where possible, for each type of luminaire provide fluorescent emergency power supply units produced by a single manufacturer.
  - 4. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. Description: Self-contained fluorescent emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- C. Compatibility:
  - 1. Ballasts: Compatible with electronic, standard magnetic, energy saving, and dimming AC ballasts, including those with end of lamp life shutdown circuits.
  - 2. Lamps: Compatible with low-mercury lamps.
- D. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the fluorescent emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- E. Battery: Sealed maintenance-free high-temperature nickel cadmium unless otherwise indicated.
- F. Emergency Illumination Output:
  - 1. Luminaires with F32T8 Lamps: Operate two lamp(s) at a minimum of 1350 lumens unless otherwise indicated with indicated illumination evenly divided between the lamps.
- G. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.
- H. Operating Temperature: From 32 degrees F to 122 degrees F unless otherwise indicated or required for the installed location.
- I. Accessories:
  - 1. Provide compatible accessory remote combination test switch/indicator light where indicated.

## 2.09 LAMPS

- A. Manufacturers:
  - 1. General Electric Company/GE Lighting: [www.gelighting.com](http://www.gelighting.com).
  - 2. Osram Sylvania: [www.sylvania.com](http://www.sylvania.com).
  - 3. Philips Lighting Company: [www.lighting.philips.com](http://www.lighting.philips.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
  - 5. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.
- B. Lamps - General Requirements:
  - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
  - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
  - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.



4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect Engineer to be inconsistent in perceived color temperature.
- C. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
  1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
  2. T8 Linear Fluorescent Lamps:
    - a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
    - b. Color Rendering Index (CRI): Not less than 80.
    - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
  3. T5 Linear Fluorescent Lamps:
    - a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
    - b. Color Rendering Index (CRI): Not less than 80.
    - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
- D. Lamp Types: As specified for each fixture.

## **2.10 ACCESSORIES**

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.
- D. Tube Guards for Linear Fluorescent Lamps: Provide clear virgin polycarbonate sleeves with endcaps where indicated.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Suspended Ceiling Mounted Luminaires:
  1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
  3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
  4. Secure pendant-mounted luminaires to building structure.
  5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
  7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- F. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
  2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
  3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- G. Suspended Luminaires:
1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
  2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
  3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.
  4. Install canopies tight to mounting surface.
  5. Unless otherwise indicated, support pendants from swivel hangers.
- H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- I. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).
- J. Install accessories furnished with each luminaire.
- K. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.
- L. Bond products and metal accessories to branch circuit equipment grounding conductor.
- M. Fluorescent Luminaires Controlled by Dual-Level Switching: Connect such that each switch controls the same corresponding lamps in each luminaire.
- N. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- O. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- P. Fluorescent Emergency Power Supply Units:
1. For field-installed units, install inside luminaire unless otherwise indicated. Where installation inside luminaire is not possible, install on top of luminaire.
  2. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal ballast(s) in luminaire. Bypass local switches, contactors, or other lighting controls.

- Q. Remote Ballasts: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.
- R. Install lamps in each luminaire.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Perform field inspection in accordance with Section 01 40 00.
- D. Operate each luminaire after installation and connection to verify proper operation.
- E. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- F. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect Engineer.

### **3.05 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect Engineer. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect Engineer or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect Engineer or authority having jurisdiction.
- D. Aim and adjust fixtures as indicated.
- E. Position exit sign directional arrows as indicated.

### **3.06 CLEANING**

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean finishes and touch up damage.

### **3.07 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of luminaires to Architect Engineer, and correct deficiencies or make adjustments as directed.
- D. Just prior to Substantial Completion, replace all lamps that have failed.

### **3.08 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 28 31 00**  
**FIRE DETECTION AND ALARM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire alarm system design and installation, including all components, wiring, and conduit.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping: Materials and methods for work to be performed by this installer.

**1.03 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits; 2002 (Cor 1, 2012).
- D. NFPA 3 - Recommended Practice for Commissioning of Fire Protection and Life Safety Systems; 2015.
- E. NFPA 4 - Standard for Integrated Fire Protection and Life Safety System Testing; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 72 - National Fire Alarm and Signaling Code; 2013.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
  - 1. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
  - 2. Certification by Contractor that the system design will comply with the contract documents.
- C. Drawings must be prepared using AutoCAD Release 2002 or newer.
- D. Evidence of designer qualifications.
- E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction as well as compliance with contract documents, including but not limited to floor plans, riser diagrams, and description of operation:
  - 1. Copy (if any) of list of data required by authority having jurisdiction.
  - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
  - 3. Shop Drawings:
    - a. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A.14.6.2.4, and complete listing of software required.
    - b. System zone boundaries and interfaces to fire safety systems.
    - c. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming. Plans shall show the address for addressable devices.
    - d. Circuit and conduit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
      - 1) Calculation method shall be shown including wire size and values used.
      - 2) Calculation shall be Lump Sum at the end of the circuit or Point to Point. Load Centering shall not be used.
    - e. List of all devices on each signaling line circuit, with spare capacity indicated.

4. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
    - a. Information to include: Model numbers, listing, ratings, and power requirements.
    - b. Product cut sheets, calculations, certificates, etc. shall be submitted in a bound format or a single electronic document (such as PDF), shall be tabbed in a logical manner, and shall contain the information indicated.
  5. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
  6. Certification by the manufacturer of the control unit that the system design complies with the contract documents.
  7. Certification by Contractor that the system design complies with the contract documents.
  8. Incomplete submittals or submittals that do not comply with these specifications may be rejected without a review.
- F. Evidence of installer qualifications.
- G. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
  2. Submit documentation of satisfactory inspections and tests.
  3. Submit NFPA 72 "Inspection and Test Form," filled out.
- H. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
  2. "As installed" wiring and schematic diagrams, with final terminal identifications.
  3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- I. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
  2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

#### **1.05 QUALITY ASSURANCE**

- A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
  2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
    - a. Demonstrated qualifications through written assessment of at least NICET level II, or AE approved equivalent. This includes individuals installing conduit, boxes, or wire for fire alarm devices.
  3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
  4. Contract maintenance office located within 100 miles of project site.
  5. Certified in the State of Arkansas as fire alarm installer.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Fire Alarm Control Units - Basis of Design: Siemens Building Technologies, Inc ; \_\_\_\_\_ :  
www.usa.siemens.com.
- B. Initiating Devices, and Notification Appliances:
  - 1. Siemens Building Technologies, Inc: www.sbt.siemens.com.
  - 2. Same manufacturer as control units.
  - 3. Provide all initiating devices and notification appliances made by the same manufacturer.

### 2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:
  - 1. Provide all components necessary, regardless of whether shown in the contract documents or not.
  - 2. Provide all labor to complete required work.
  - 3. Protected Premises: Entire building shown on drawings.
  - 4. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    - a. ADA Standards.
    - b. The requirements of the State Fire Marshal.
    - c. The requirements of the local authority having jurisdiction, which is City of Little Rock.
    - d. Applicable local codes.
    - e. The contract documents (drawings and specifications).
    - f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
  - 5. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
    - a. This shall include, but not be limited to, all public restrooms, break rooms, exam rooms, fitting rooms, work rooms, conference rooms, open office areas, and corridors.
- B. Circuits:
  - 1. Signaling Line Circuits (SLC) : Match Existing.
  - 2. Notification Appliance Circuits (NAC): Match Existing.
- C. Power Sources:
  - 1. Primary: Dedicated branch circuits of the facility power distribution system.
  - 2. Secondary: Storage batteries.
  - 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
  - 4. Unless noted otherwise on the plans, power booster panels (NAC) shall not be fed from a separate notification power booster panel (daisy chained). Each NAC shall be triggered by a SLC circuit.
- D. Guards for Protection of Components
  - 1. Description: Welded wire mesh or polycarbonate of size and shape for the manual station, smoke detector, strobe, or other device requiring protection.
    - a. Factory fabricated and furnished by manufacturer of the device.
    - b. Finish: Clear, or paint of color to match the protected device.

- c. Listed components of Safety Technology International Incorporated may be used with applicable de-ratings for strobes, horns, etc.

### 2.03 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.

### 2.04 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
  - 1. Suppression control valves.
  - 2. Duct smoke detectors.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
  - 1. Total flooding suppression system activation; also disconnect fuel source.
  - 2. Smoke Detector(s)
  - 3. Heat Detector(s)
  - 4. Manual Pull Stations

### 2.05 COMPONENTS

- A. General:
  - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
  - 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
  - 3. Provide legible, permanent labels for each addressable device, using address used in control panel.
- B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Initiating Devices:
  - 1. Manual Pull Stations: Double-Action.
    - a. Provide 1 extra.
  - 2. Heat Detectors: As required.
    - a. Provide 1 extra.
- D. Notification Appliances:
  - 1. Horn/Strobes White Trim Clear Strobe.
    - a. Selectable candela with candela visible when installed.
- E. Conduit:
  - 1. Install all wiring in a conduit or raceway. Conduit fill shall not exceed 40 percent of the interior cross sectional area where three or more cables are included within a single conduit.
  - 2. Install conduit in accordance with the National Electrical Code, NFPA 70.
  - 3. Conduit shall be 3/4 inch minimum.
  - 4. Wiring for low voltage control, alarm notification, emergency communication, and similar power-limited auxiliary functions may be installed in the same conduit as initiating and signaling line circuits. Design system to permit simultaneous operation of all circuits without interference or loss of signals.
  - 5. Fire Alarm Conduit: All fire alarm wiring shall be in hot-galvanized electric metallic tubing colored RED from the factory.
    - a. Junction covers shall be painted red and labeled "Fire Alarm".
    - b. Fire alarm conduit shall have the wording "Fire Alarm" factory stamped onto each 10' section of conduit. If conduit is to be exposed in a finished area, see criteria below.



- c. If conduit is to be ran in an area with finished exposed ceiling spaces, consult with architect engineer for appropriate conduit and junction box color to match other equipment.
  6. Conduits shall not enter the control panel or any other component provided except where entry is specified by the manufacturer.
- F. Wire:
  1. All fire alarm system wiring shall be new.
  2. Wiring shall comply with local, state, and national codes and as recommended by the manufacturer. Number and size of conductors shall be as recommended by the manufacturer, but shall be not less than 18 AWG for initiating device and signaling line circuits, and 16 AWG for notification appliance circuits.
  3. All wiring and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
  4. FPLP red cable shall be used for all interior fire alarm circuits including that in conduit.
  5. Any wire that goes underground, such as to PIV switches or to other buildings, shall be listed and approved for wet locations in accordance with NFPA 70.
  6. All field wiring shall be supervised for open circuits, short circuits, and grounded conditions.
- G. Circuit Conductors: Copper; provide 200 feet extra; color code and label.
- H. Wiring runs shall be tested for continuity, short circuits and grounds before any system devices are installed or energized.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

### **3.02 INSPECTION AND TESTING FOR COMPLETION**

- A. The contractor is responsible for testing all components in accordance with the manufacturers required and suggested procedures and in accordance with NFPA 72. If this specification incorporates a detailed Acceptance Test Procedure (ATP) prepared by the engineer than it shall also be followed.
- B. Every fire alarm system shall be pre-tested by the contractor prior to scheduleing any inspections by the architect engineer, owner, or local jurisdictions. Testing shall comply with this section and NFPA 72.
- C. Notify Owner 7 days prior to beginning completion inspections and tests.
- D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
  1. A signed Record of Completion shall be provided to the inspector prior to their inspection.
- E. Provide the service of a competent, factory-trained technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.
- F. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- G. Provide all tools, software, and supplies required to accomplish inspection and testing.
- H. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

- I. All smoke detectors shall be tested using canned smoke, or other approved method that will functionally test the smoke chamber. The use of magnets to commission smoke detectors is strictly prohibited.
- J. Smoke detectors shall not be installed until the construction cleanup of all trades is complete per NFPA 72 and this section.
  - 1. Orange shipping covers, rubber gloves, tape, or other devices shall not be used to try and get around these basic requirements.
  - 2. Smoke detectors installed before the clean-up of all other dust or particle producing trades and without prior written approval of the engineer and local AHJ shall be replaced at the sole expense of the installing contractor.
  - 3. AE reserves the right to permanently and indelibly mark any detector installed this way.
  - 4. Contractor is urged to use marked, temporary detectors for pre-testing of system and replace with new detectors prior to final testing.
- K. All new smoke detectors that show to be "Dirty" through system sensitivity shall be replaced.
- L. Audibility testing shall not be conducted until all doors, windows, walls, ceilings, and carpeting are in place. Final audibility testing that does not affect speaker placement should be done after space is fully furnished.
- M. At a minimum the following tests shall be conducted, documented and given to AE at closeout:
  - 1. Open initiating device circuits and verify that the trouble signal actuates.
  - 2. Open and short signaling line circuits and verify that the trouble signal actuates.
  - 3. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
  - 4. Ground all circuits and verify response of trouble signals.
  - 5. Check presence and audibility of tone throughout building spaces. This includes measuring dBA levels.
    - a. A minimum of 15 dBA above ambient shall be obtained in every occupiable space (throughout) per NFPA 72. This includes storage rooms, electrical rooms, telephone rooms, and any other occupiable space.
  - 6.
  - 7. Each of the alarm, trouble, or supervisory conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
  - 8. Each notification circuit shall be tested under standby power. End-of-line voltage readings shall be taken at the end-of-line resistor for Class "B" circuits, or at the booster panel for Class "A" circuits. Circuit voltage drop shall be recorded and compared to calculated voltage drop. Note: Some systems incorporating synchronizing modules can impair results. If the module cannot be bypassed for voltage readings, the manufacturer should be contacted for guidance.
  - 9. System off-site reporting shall be verified for alarm, supervisory, trouble, correct address, facility name, contact phone number, and contact name.
  - 10. When the system is equipped with optional features or connected to external, non-fire devices, the manufacturer's manual should be consulted to determine the proper testing procedures.
- N. The commissioning inspector shall use the system record drawings and other documents specified under this specification during the testing procedure to verify operation as programmed. In conducting the commissioning test, the inspector shall request demonstration of any or all input and output functions.
- O. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.
- P. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
  - 1. Record all system operations and malfunctions.
  - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.

3. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

### **3.03 CLOSEOUT**

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
  1. Be prepared to conduct any of the required tests.
  2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
  3. Have authorized technical representative of control unit manufacturer present during demonstration.
  4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
  5. Repeat demonstration until successful.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 31 10 00**  
**SITE CLEARING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

**1.02 RELATED REQUIREMENTS**

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 57 13 - Temporary Erosion and Sediment Control.
- D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- E. Section 31 22 00 - Grading: Topsoil removal.
- F. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

**PART 2 PRODUCTS**

**2.01 MATERIALS - NOT USED**

**PART 3 EXECUTION**

**3.01 SITE CLEARING**

- A. Comply with other requirements specified in Section 01 70 00.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

**3.02 EXISTING UTILITIES AND BUILT ELEMENTS**

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt utilities without permission from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

**3.03 VEGETATION**

- A. Scope: Remove vegetation in areas to be covered by building structure.
- B. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
- C. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

**3.04 DEBRIS**

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

**SECTION 31 22 00**

**GRADING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Removal of topsoil.
- B. Rough grading the site for site structures and building pads.
- C. Finish grading .

**1.02 RELATED REQUIREMENTS**

- A. Section 31 10 00 - Site Clearing.
- B. Section 31 23 16 - Excavation.
- C. Section 31 23 23 - Fill: Filling and compaction.
- D. Section 32 92 23 - Sodding: Finish ground cover.

**1.03 SUBMITTALS**

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

**1.04 QUALITY ASSURANCE**

- A. Employ services of a Geotechnical Consultant, approved by Architect Engineer, for the following services:
  - 1. Develop stripping techniques best suitable to site conditions at the time of construction.
  - 2. Review and advise on size of earthmoving equipment. Verify that soils on Site will not lose strength during earthmoving operations.
  - 3. Observe site grading.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Topsoil: See Section 31 23 23.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

**3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Notify utility company to remove and relocate utilities.
- E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- F. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

**3.03 ROUGH GRADING**

- A. Remove subsoil and topsoil from areas to be filled or further excavated to a depth of 6", without mixing with foreign materials. Separate subsoil from topsoil.
- B. Do not remove topsoil when wet.
- C. When excavating through roots, perform work by hand and cut roots with sharp axe.
- D. See Section 31 23 23 for filling procedures.

**3.04 SOIL REMOVAL**

- A. Stockpile excavated topsoil on site.
- B. Stockpile excavated subsoil on site.
- C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

**3.05 FINISH GRADING**

- A. Before Finish Grading:
  - 1. Verify building and trench backfilling have been inspected.
  - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- E. Place topsoil to the following compacted thicknesses:
  - 1. Areas to be Sodded: 4 inches.
- F. Place topsoil during dry weather.
- G. Remove roots, weeds, rocks, and foreign material while spreading.
- H. Near plants spread topsoil manually to prevent damage.
- I. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- J. Lightly compact placed topsoil.

**3.06 TOLERANCES**

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

**3.07 REPAIR AND RESTORATION**

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

**3.08 FIELD QUALITY CONTROL**

- A. See Section 31 23 23 for compaction density testing.

**3.09 CLEANING**

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile areas to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

**END OF SECTION**



**SECTION 31 23 16**  
**EXCAVATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Excavating for building volume below grade, footings, slabs-on-grade, and utilities within the building.
- B. Trenching for utilities outside the building to utility main connections.

**1.02 RELATED REQUIREMENTS**

- A. Document 00300 - Information Available to Bidders: Geotechnical report; bore hole locations and findings of subsurface materials.
- B. Section 01 57 13 - Temporary Erosion and Sedimentation Control: Slope protection and erosion control.
- C. Section 014000 (01400) - Quality Requirements: Qualifications for Geotechnical Consultant.
- D. Section 01 70 00 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.
- E. Section 31 22 00 - Grading: Soil removal from surface of site.
- F. Section 31 22 00 - Grading: Grading.
- G. Section 31 23 23 - Fill: Fill materials, filling, and compacting.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for excavation.

**1.04 QUALITY ASSURANCE**

- A. Engage and pay for a Geotechnical Consultant, approved by Architect Engineer for the following services:
  - 1. Determine equipment sizes, and develop excavation, proof-rolling, undercutting, filling, and compaction techniques best suitable to site conditions at the time of construction.
  - 2. Observe the site excavation.
  - 3. Perform applicable laboratory and field tests.
  - 4. Provide professional judgment in determining the limits of undercutting. This judgment shall be to the satisfaction of Architect Engineer.
  - 5. Inspect bottom of individual and continuous footings. For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Architect Engineer.

**1.05 PROJECT CONDITIONS**

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Review size of earthmoving equipment with Geotechnical Consultant. Verify that the silty clay soils on the site will not lose strength during earthmoving operation

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the work are as indicated.

**3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 22 00 for additional requirements.

- C. Locate, identify, and protect utilities that remain and protect from damage.

### **3.03 EXCAVATING**

- A. Excavate to accommodate new structures and construction operations.
- B. Notify Architect Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
  - 1. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- D. Comply with Occupational Safety and Health Administration (OSHA) Safety and Health Regulations for Construction, 29 CFR 1926, Subpart P - Excavations.
- E. Frost Protection: When freezing temperature may be expected, do not excavate to the full depth indicated unless the footings or slabs are to be poured immediately after the excavation has been completed. If placing of concrete is delayed, protect the bottoms of excavations from frost until concrete is placed.
- F. Shoring And Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition.
  - 1. Establish requirements for trench shoring and bracing to comply with local codes, OSHA, and authorities having jurisdiction.
  - 2. Install and maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses in order to protect work, to insure safety to workmen and public, and to protect and maintain existing structures, footings, roadways, utilities, etc. adjacent thereto.
  - 3. Design and installation is the sole responsibility of the Contractor and shall be reviewed by a Registered Professional Engineer at the Contractor's expense.
- G. Do not interfere with 45 degree bearing splay of foundations.
- H. Cut utility trenches wide enough to allow inspection of installed utilities.
- I. Hand trim excavations. Remove loose matter.
- J. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.
- K. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- L. Remove excavated material that is unsuitable for re-use from site.
- M. Remove excess excavated material from site.

### **3.04 PROOF-ROLLING UNDER THE BUILDING**

- A. Following clearing, stripping, and/or excavating, all subgrade soils are to be proof-rolled under the supervision of Geotechnical Consultant with at least a 10 ton roller or similar mechanical compactor, to verify that any localized soft, compressible soils are detected. If soft or unstable soils are detected, Geotechnical Consultant, after obtaining approval from the Architect Engineer, shall determine the course of action.
- B. Extra payment for removal of soft and unstable soil and replacement with structural fill in accordance with Division 31 Sections "Excavation" and "Fill" will be based on the "Unit Price" quoted by the Contractor.
  - 1. Extra payment shall be applied against the allowance established in the contract for the item: Undercutting. The portion of the allowance not used shall be credited to the Owner based on the same unit price quoted in the contract documents. Any additional undercutting required above the allowance established, shall be based on the same "Unit Price" quoted by the Contractor but only after consultation with Geotechnical Consultant and approved by Architect Engineer.
  - 2. The undercut material shall be disposed of off the site and shall not be used for fill.

3. Measurement for determining the extent of undercutting will be by the average end area method for the volume of excavated material below existing subgrade. A registered engineer or surveyor shall be engaged by Contractor to perform these measurements. The report of this surveyor shall be submitted to the Architect Engineer for approval.

**3.05 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

**3.06 PROTECTION**

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**

## SECTION 31 23 23

### FILL

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

##### 1.02 RELATED REQUIREMENTS

- A. Section 01 57 13 - Temporary Erosion and Sedimentation Control: Slope protection and erosion control.
- B. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

##### 1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

##### 1.04 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

##### 1.05 REFERENCE STANDARDS

- A. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- B. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 2012.
- C. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- E. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- F. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

##### 1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Proposed Fill Material: For each soil type proposed for use, include the following:
  - 1. Classification per ASTM D 2487-00, Plasticity Index (PI), and Liquid Limit (LL).
  - 2. Proctor tests results.
- C. Fill Composition Test Reports: Results of laboratory tests on actual materials use
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- E. Compaction Density Test Reports.

##### 1.07 QUALITY ASSURANCE

- A. Engage a Geotechnical Consultant, approved by Architect Engineer for the following services:
  - 1. Develop filling and compaction techniques best suitable to site conditions at the time of construction.
  - 2. Observe site filling.
  - 3. Analyze soil materials proposed to be used as fill.
  - 4. Perform applicable laboratory and field tests.

- B. Perform all testing work in accordance with the following:
  - 1. Fill Properties:
    - a. Plasticity Index shall be determined as per ASTM D4318-00 "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils".
    - b. Sieve Analysis shall be as per ASTM D422-63(1998) "Standard Test Method for Particle-Size Analysis of Soils".
    - c. Water Content Density Relationship shall be determined as per ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) Modified Proctor Test.
    - d. Relative density shall be determined as per ASTM D4253-00 "Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table".
- C. Compacted fill that does not reach the required density may be rejected by Geotechnical Consultant with approval from Architect Engineer. Recompact the Work to the required density, or remove the material in the area(s) affected, and replace removed material with fill compacted to the required density.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. When necessary, store materials on site in advance of need.
- B. Review size of earthmoving equipment with Geotechnical Consultant. Ensure that the silty clay soils on site will not lose strength during earthmoving operation

## **PART 2 PRODUCTS**

### **2.01 FILL MATERIALS**

- A. General Fill: Imported borrow or local borrow capable of forming a stable embankment and free of roots and other unsatisfactory debris.
  - 1. Do not use with 5 feet of building or walk.
  - 2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- B. Structural Fill: Imported borrow or local borrow.
  - 1. Graded.
  - 2. Free of debris and rocks larger than 3 inches except within upper 18 inches of finished subgrade maximum rock size is 1-1/2 inch.
  - 3. Conforming to ASTM D2487 Group Symbol GC, SC and CL.
  - 4. Plasticity Index less than 20.
  - 5. Structural Fill for walks shall be Aggregate Base Course conforming to Section 32 11 23.
- C. Concrete for Fill: As specified in Section 033000 (03300); compressive strength of 2500 psi.
- D. Granular Fill: Graded from 1/4 inch to 1-1/2 inch.
- E. Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
- F. Topsoil: Friable loam; imported borrow or local borrow.
  - 1. Free of roots, rocks larger than 1 inch, subsoil, debris, large weeds and foreign matter.

### **2.02 SOURCE QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.

- B. Identify required lines, levels, contours, and datum locations.
- C. See Section 31 22 00 for additional requirements.

### **3.02 PREPARATION**

- A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

### **3.03 FILLING**

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
  - 1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
  - 2. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.
- E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- F. Correct areas that are over-excavated.
  - 1. Load-bearing foundation surfaces: Fill with concrete.
  - 2. Under slabs-on-grade, and similar construction: Use structural fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density within 2% of optimum moisture content.
  - 3. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 percent of maximum dry density.
- G. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. Under slabs-on-grade, and similar construction: Use structural fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density within 2% of optimum moisture content.
  - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 percent of maximum dry densit
- H. Reshape and re-compact fills subjected to vehicular traffic.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D3017, or ASTM D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests (General or Structural fill): One for each 2500 sq. ft. of lift.
- F. Frequency of Tests (Trench fill) : One for every 200 lineal feet of trench per lift of fill in place.

### **3.05 PROTECTION AND MAINTENANCE**

- A. Protection Of Graded Areas: Protect newly graded areas from traffic, erosion, and effects of ponding of water. Keep free of trash and debris.

1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
  2. Provide and maintain positive surface drainage to prevent ponding and subsequent saturation of excavation or fill materials. Saturated soils shall be removed and replaced or shall be dried to specified moisture content and recompacted without additional charge to Owner.
- B. Reconditioning Compacted And/Or Excavated Areas: Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction. Failure of the disturbed soil to reach the required density, as evidenced by density tests, is cause for rejection by Geotechnical Consultant after obtaining approval from Architect Engineer of the work in the affected area(s). Remove and replace soils which cannot recompact to the required density.
- C. Settling: Where settling is measurable or observable at fill areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### **3.06 CLEANING**

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION**



**SECTION 31 31 16**  
**TERMITE CONTROL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Chemical soil treatment.

**1.02 REFERENCE STANDARDS**

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 2001).

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- C. Test Reports: Indicate regulatory agency approval reports when required.
- D. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.
- E. Maintenance Data: Indicate re-treatment schedule .
- F. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing this type of work and:
  - 1. Approved by manufacturer of treatment materials.
  - 2. Licensed in the State of Arkansas.

**1.05 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year installer's warranty against damage to building caused by termites.
  - 1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
  - 2. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.
- B. Diluent: Recommended by toxicant manufacturer.

**2.02 MIXES**

- A. Mix toxicant to manufacturer's instructions.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- B. Verify final grading is complete.

**3.02 APPLICATION**

- A. Comply with requirements of U.S. EPA and applicable state and local codes.
- B. Spray apply toxicant in accordance with manufacturer's instructions.
- C. Apply toxicant at following locations:
  - 1. Under Slabs-on-Grade.

2. At Both Sides of Foundation Surface.
  3. Soil Within 10 feet of Building Perimeter For a Depth of \_\_\_\_ feet.
- D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.
  - E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.
  - F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
  - G. Re-treat disturbed treated soil with same toxicant as original treatment.
  - H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

**3.03 PROTECTION**

- A. Do not permit soil grading over treated work.

**END OF SECTION**

**SECTION 32 11 23**  
**AGGREGATE BASE COURSES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Aggregate base course.

**1.02 REFERENCE STANDARDS**

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010
- B. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Latest Edition.
- C. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. When aggregate materials need to be stored on site, locate where directed by Owner.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Aggregate for Base Course: In accordance with AHTD Standard Specifications for Class 7 Aggregate Base Course for materials and workmanship.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

**3.02 INSTALLATION**

- A. Place aggregate in maximum 6" layers and \_\_\_\_ compact to specified density.
- B. Level and contour surfaces to elevations and gradients indicated.
- C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

**3.03 TOLERANCES**

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

**3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D2167.

- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T180.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests: One for every 2500 sq. ft. per lift in place..

**3.05 CLEANING**

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

**END OF SECTION**

**SECTION 32 13 13**  
**CONCRETE PAVING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete sidewalks.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 23 23 - Fill: Compacted subgrade for paving.

**1.03 REFERENCE STANDARDS**

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- D. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
- E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2013.
- G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012a.
- I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2013.
- J. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- K. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2012.
- L. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- M. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- N. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.
- O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
- P. ASTM D 5893 - Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements; 2004.
- Q. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on joint filler, admixtures, and curing compound.
- C. Test Data: Provide field quality control test reports.

**PART 2 PRODUCTS**

**2.01 PAVING ASSEMBLIES**

- A. Comply with applicable requirements of ACI 301.

## **2.02 FORM MATERIALS**

- A. Form Materials: Conform to ACI 301.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
  - 1. Thickness: 1/2 inch.

## **2.03 CONCRETE MATERIALS**

- A. Obtain cementitious materials from same source throughout.
- B. Cement: ASTM C150/C150M Normal - Type I portland type, grey color.
- C. Fine and Coarse Mix Aggregates: ASTM C33/C33M.
- D. Fly Ash: ASTM C618, Class C or F.
- E. Water: Clean, and not detrimental to concrete.
- F. Air-Entraining Admixtures: ASTM C260/C260M.

## **2.04 ACCESSORIES**

- A. Curing Compound: ASTM C309, Type 1, Class A.
- B. Materials for sealing expansion joints shall be ASTM D 5893.

## **2.05 CONCRETE MIX DESIGN**

- A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
  - 1. For trial mixtures method, employ independent testing agency acceptable to Architect Engineer for preparing and reporting proposed mix designs.
- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- C. Concrete Properties:
  - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3000 psi.
  - 2. Total Air Content: 6 percent plus or minus 1 percent, determined in accordance with ASTM C 173/C 173M.
  - 3. Maximum Slump: 3 inches.
  - 4. Maximum Aggregate Size: 3/4 inch.

## **2.06 MIXING**

- A. Transit Mixers: Comply with ASTM C94/C94M.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

### **3.02 PREPARATION**

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Architect Engineer minimum 24 hours prior to commencement of concreting operations.

### **3.03 FORMING**

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

### **3.04 COLD AND HOT WEATHER CONCRETING**

- A. Follow recommendations of ACI 305R when concreting during hot weather.

- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

### **3.05 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 304R.
- B. Do not place concrete when base surface is wet.
- C. Repair of Surface Defects: Immediately patch all repairable defective areas after form removal. If the repairs do not bring the Work into conformance, remove and re-pour.

### **3.06 JOINTS**

- A. Place 1/2 inch wide expansion joints at 40 foot intervals, unless indicated otherwise, and to separate walks from vertical surfaces and other components.
- B. Saw cut contraction joints 1/8 inch wide at intervals indicated at an optimum time after finishing. Cut 1/4 into depth of slab.

### **3.07 FINISHING**

- A. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.
- B. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

### **3.08 TOLERANCES**

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

### **3.09 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
  - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
  - 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
  - 3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- B. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
  - 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
  - 2. Perform one slump test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

### **3.10 PROTECTION**

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian traffic over walks until 75 percent design strength of concrete has been achieved.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**



**SECTION 32 31 13**  
**CHAIN LINK FENCES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fence framework, fabric, and accessories.
- B. Fencing to match fencing for the Animal Quarantine Pens.

**1.02 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2011.
- D. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric; 2011.
- E. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2010.

**1.03 SUBMITTALS**

- A. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
- C. Manufacturer's Installation Instructions: Indicate installation requirements.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Materials and Components: Conform to CLFMI Product Manual, [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
- B. Posts, Rails, and Frames: ASTM F1083 Schedule 40 hot-dipped galvanized steel pipe, welded construction, minimum yield strength of 30 ksi.
- C. Wire Fabric: ASTM F668 polymer-coated steel chain link fabric.

**2.02 COMPONENTS**

- A. Line Posts: 2.38 inch diameter.
- B. Corner Posts: 2.38 inch diameter.
- C. Fabric: 2 inch diamond mesh interwoven wire, 11 gage, 0.0907 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.
- D. Tension Wire: 6 gage, 0.1620 inch thick steel, single strand.
- E. Tie Wire: Aluminum alloy steel wire.

**2.03 ACCESSORIES**

- A. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.
- B. Privacy Slats: Vinyl strips, sized to fit fabric weave. Locate where indicated.

**2.04 FINISHES**

- A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 oz/sq ft.
- B. Fabric: Vinyl coated over coating of 1.8 oz/sq ft galvanizing.
- C. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.
- D. Color(s): To be selected by Architect Engineer from manufacturer's standard range.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install framework, fabric, accessories in accordance with ASTM F567.
- B. Place fabric on centerline of posts and rails.
- C. Install tie wires, tension wires, clips, and other accessories as necessary to prevent injury to animals and people.
- D. Do not stretch fabric until concrete foundation has cured 28 days.
- E. Position bottom of fabric 1 inches above finished masonry or slab.
- F. Fasten fabric to bottom rail, line posts, braces, and top tension wire with tie wire at maximum 15 inches on centers.
- G. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- H. Install top tension wire stretched taut between posts.

**END OF SECTION**

**SECTION 32 92 23**  
**SODDING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Fertilizing.
- D. Sod installation.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 22 00 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.
- B. Section 31 23 23 - Fill: Topsoil material.

**1.03 DEFINITIONS**

- A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

**1.04 REFERENCE STANDARDS**

- A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; Turfgrass Producers International; 2006.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Certification: Submit certification of grass species and location of sod source.

**1.06 QUALITY ASSURANCE**

- A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Arkansas.
- B. Installer Qualifications: Company approved by the sod producer.

**1.07 REGULATORY REQUIREMENTS**

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver sod on pallets. Protect exposed roots from dehydration.
- B. Do not deliver more sod than can be laid within 24 hours.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- D. Furnish service and maintenance of sodded areas for three months from Date of Substantial Completion.
- E. Maintain sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Sod: TPI, Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.

1. 419 Hybrid Bermuda Grass Type: 100 percent.
- B. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions:
  1. Nitrogen: 20 percent.
  2. Phosphoric Acid: 20 percent.
  3. Soluble Potash: 10 percent.
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

## **2.02 ACCESSORIES**

- A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

## **2.03 SOURCE QUALITY CONTROL**

- A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, \_\_\_\_\_, soluble salt content, organic matter content, and pH value.
- B. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
- C. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that prepared soil base is ready to receive the work of this section.

### **3.02 PREPARATION**

- A. Prepare subgrade in accordance with Section 31 22 00.
- B. Place topsoil in accordance with Section 31 22 00.

### **3.03 FERTILIZING**

- A. Apply fertilizer in accordance with manufacturer's instructions.
- B. Apply after smooth raking of topsoil and prior to installation of sod.
- C. Apply fertilizer no more than 48 hours before laying sod.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

### **3.04 LAYING SOD**

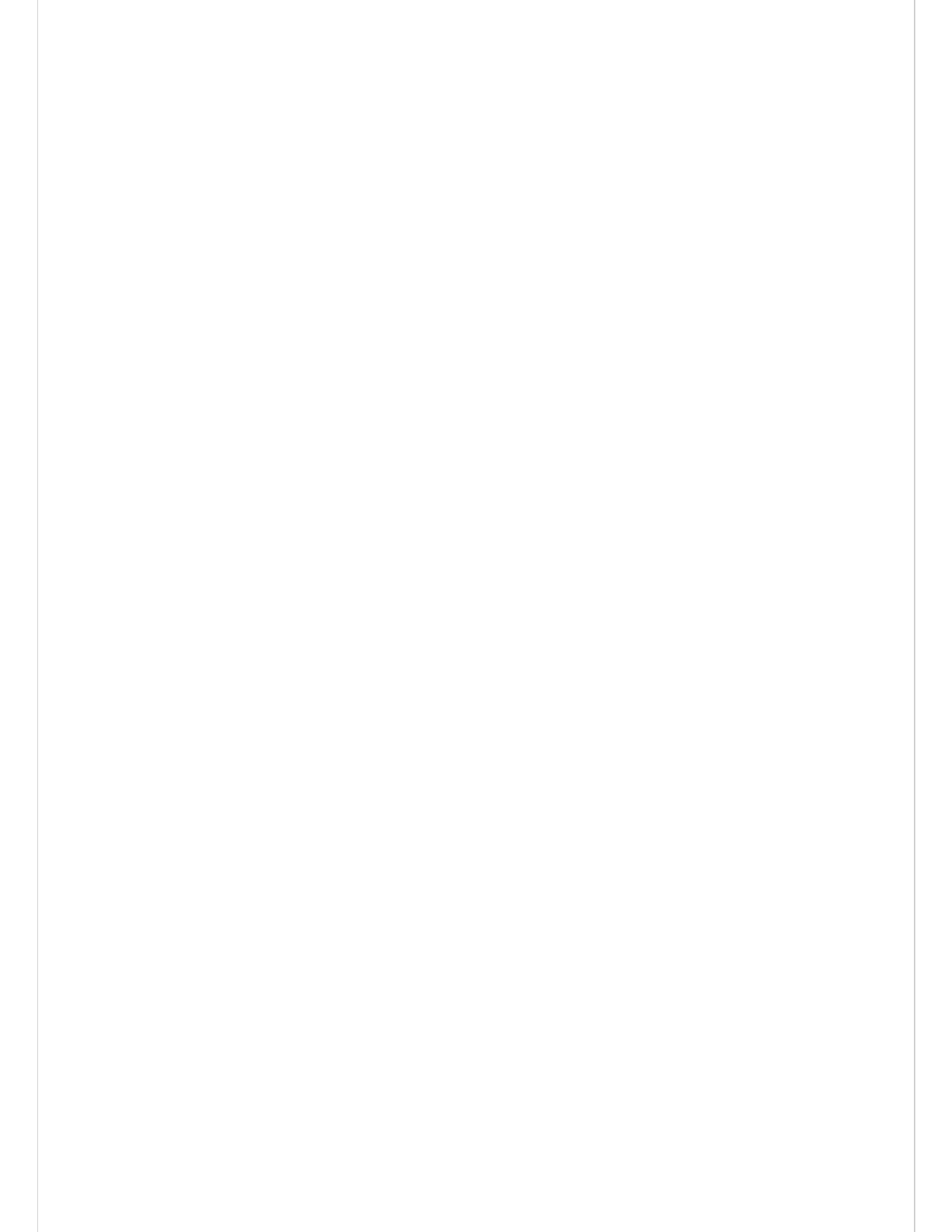
- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- D. Where new sod adjoins existing grass areas, align top surfaces.
- E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.
- F. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.
- G. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.
- H. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 112 lbs.

**3.05 MAINTENANCE**

- A. Provide maintenance at no extra cost to Owner; Owner will pay for water.
- B. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- C. Neatly trim edges and hand clip where necessary.
- D. Immediately remove clippings after mowing and trimming.
- E. Water to prevent grass and soil from drying out.
- F. Roll surface to remove irregularities.
- G. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- H. Immediately replace sod to areas that show deterioration or bare spots.
- I. Protect sodded areas with warning signs during maintenance period.

**END OF SECTION**

**This page was intentionally left blank for duplex printing.**





**Crematorium Addition for Animal Village, City of Little Rock**

4500 Kramer Street, Little Rock, Arkansas

**Construction Documents**



**C R O M W E L L**

Architect Engineer Project No. 2014-205-10

Issue Date: 30-Jan-2015