

PROJECT MANUAL

**THE CITY OF SOUTHFIELD**  
**PUBLIC WORKS DEPARTMENT**  
**DPW STORAGE BUILDING ADDITION**

**PROJECT NO.: 0153-22-0070**

**PROJECT ADDRESS:**

**25501 CLARA LANE**

**SOUTHFIELD, MICHIGAN**

**ISSUED FOR BIDS**

**DATE: November 13, 2023**

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UNDERLINED ITEMS REQUIRED TO BE SUBMITTED FOR COMPLETE BID

ADVERTISEMENT FOR BIDS  
**SOUTHFIELD DPW STORAGE BUILDING ADDITION**  
IN THE CITY OF SOUTHFIELD, OAKLAND COUNTY, MICHIGAN

**ADVERTISEMENT OF PROJECT: NOVEMBER 13, 2023**  
**BIDS DUE: DECEMBER 19, 2023** **11:00 A.M., LOCAL TIME**

The City of Southfield, Oakland County, Michigan, will receive bids electronically up to **11:00 A.M.**, Local Time on **DECEMBER 19, 2023** for the **Southfield DPW Storage Building Addition** project.

This project generally includes the following:

- Construction of new pre-engineered metal building and associated mechanical and electrical work.
- Site Utilities and site Infrastructure to serve new building.

The Drawings and Specifications under which work is to be done may be obtained through the Michigan Intergovernmental Trade Network (MITN) at [www.mitn.info](http://www.mitn.info) on or after November 20, 2023 **All vendors, including Minority (MBE), Women (WBE) and Disadvantaged (DBE) Business Enterprise contractors, subcontractors, and material suppliers are encouraged to bid on this City of Southfield construction project.**

**There will be a Mandatory pre-bid walk-through on Monday, November 27, 2023 at 9 AM at the City of Southfield DPW Building located at 25501 Clara Lane, Southfield, MI 48034.**

An e-bond payable to the City of Southfield for a sum not less than five (5%) percent of the amount of the Proposal shall be required with each Proposal. The successful bidder will be required to furnish satisfactory performance, labor and material, and maintenance and guarantee bonds in the amount of 100% of the project.

The City reserves the right to reject any and all bids and to waive any irregularities in the proposals. No bids may be withdrawn after the above date and time for receiving bids for a period of sixty (60) calendar days.

Proposals are to be electronically delivered to the Purchasing Agent, in care of the City Clerk on or before **11:00 A.M.** Local Time on **December 19, 2023**. The proposal must be submitted electronically through the [BIDNET.com](http://BIDNET.com) website. Instructions for bidding will be included on the posting; additional information can be found in the Instructions to Bidder.

Allyson Bettis, City Clerk  
CITY OF SOUTHFIELD  
OAKLAND COUNTY, MICHIGAN

## INSTRUCTIONS TO BIDDER

### SCOPE OF WORK

The work under this Contract includes the furnishing of all labor, materials, equipment and construction equipment necessary for performing the work described in the Advertisement, all complete and in accordance with the Drawings and Specifications.

### DEFINITIONS

The following terms used in this Contract will be construed and defined as follows:

<b><u>"Board" - "Owner"</u></b>	The governmental agency for whom the work is being done.
<b><u>"Design Professional"</u></b>	The City of Southfield Design Professional, acting personally or by any of its authorized agents.
<b><u>"Contractor"</u></b>	The person(s) or firm contracting to perform the work.
<b><u>"Subcontractor"</u></b>	The person(s) or firm employed by the Contractor to furnish materials or service whether or not he employs labor at the site of the work.
<b><u>"Work"</u></b>	All labor, materials, equipment, transportation, construction equipment and other facilities necessary to be done or furnished by the Contractor to complete the Contract.

"Written Notice" shall be deemed to have been "duly served" when such notice shall have been given or mailed to the Contractor or his superintendent at the site of the work or the address set forth herein or when such notice shall have been given or mailed to the Owner, at the address set forth herein.

### CONTRACT DOCUMENTS

It is understood and agreed that the Advertisement, Instructions to Bidder, Proposal, Agreement, Bonds, Specifications, Drawings, Addenda and Change Orders issued by the Owner or the Design Professional, and specifications and engineering data furnished by the Contractor and approved by the Design Professional, are each included in this Contract and the work shall be done in accordance therewith.

### SUBSURFACE CONDITIONS

If borings have been made, logs thereof are in Appendix A "Geotechnical Report" of the Specifications. These borings have been made by a disinterested drilling contractor; the samples and the driller's reports are available in the office of the Owner. This information is offered to the bidder as evidence and the bidder himself shall assume the entire responsibility for any conclusions which he may draw from it. The Owner does not guarantee, however, that the ground encountered during construction will conform with these borings and the bidders should secure such other information as they consider necessary to check and supplement the above data. No additional compensation shall be payable if dewatering is required.

## **CONSTRUCTION CONDITIONS**

It is required that each bidder will examine the Contract Documents for this work and make a personal examination of the site of the proposed work and its surroundings. It is also expected that the bidder will obtain first-hand information concerning the available facilities for receiving, transporting, handling and storing construction equipment and materials and concerning other local conditions that may affect the bidder's work.

## **BID DEPOSITS**

Each Proposal must be accompanied by a bid deposit. This shall be in the form of an e-bond, for a sum not less than five percent (5%) of the amount of the Proposal drawn upon some bank in good standing or issued by a surety company authorized to do business in Michigan. This is a guarantee on the part of the bidder that he will, if called upon to do so, enter into a contract, in the attached form, to do the work covered by such Proposal at the prices stated therein and to furnish acceptable surety for its faithful and entire fulfillment. Such certified check or bidder's bond shall be made out to the Owner and shall be subject to the conditions specified in the Proposal.

## **RETURN OF BID DEPOSITS**

The bid deposits of all except the two lowest bidders will be returned within three days after the opening of bids. The bid deposits of the two lowest bidders will be returned within 48 hours after the executed Contract and the required bonds have been fully approved by the Owner or after rejection of all bids.

## **FORM OF PROPOSAL**

All Proposals must be a digital copy and signed by the bidder. A Proposal includes the following items: Hazard Communication Program – Contractor's Policy Statement, Non-Collusion Affidavit (NCA-1), Legal Status of Bidder, Bid Form, Unit Price Form, Alternates Form, Bid Deposit, and applicable Acknowledgement of Receipt of Addendum. A complete Supplemental Bid Sheet may include the base bid only; the alternate bid may be left blank by the bidder if desired.

All prices stated in the Proposal must be plainly written in legible words and/or figures using black ink or typed. Illegibility of any work and/or figure in the Proposal may be sufficient cause for rejection of the Proposal by the Owner. All spaces shall be filled in on the Proposal form.

Supplemental statements by the Contractor written into the Proposal form or by letter modifying the terms of the base Proposal will be considered as irregular and may make the Proposal subject to rejection by the Owner.

Each Proposal must be submitted electronically and labeled as follows:

Submitted Electronically to:  
Office of the City Clerk:  
[abettis@cityofsouthfield.com](mailto:abettis@cityofsouthfield.com)

**AND**

Purchasing Department:  
[Purchasingdept@cityofsouthfield.com](mailto:Purchasingdept@cityofsouthfield.com)

Labeled as:  
**Southfield DPW Storage Building  
Addition**

## **BASIS OF PROPOSAL**

Proposals are solicited on a lump sum basis of to complete all aspects of the work as identified within the contract documents. Any quantities provided are estimates provided for Contractor convenience only and should be regarded as approximate. It is the responsibility of the Contractor to confirm quantities prior to submission of Bid and to ensure Bid accurately reflects the quantities and scope of work as identified in the Contract Documents.

## **PROPOSAL DATA**

Where equipment manufacturers are required to be listed, the bidders must bid on equipment from the list of suggested manufacturers contained in the Specifications.

## **INTERPRETATION OF CONTRACT DOCUMENTS**

Neither the Owner nor Design Professional will give verbal answers to any inquiries regarding the meaning of Drawings and Specifications, or verbal instructions prior to the award of the Contract. Any verbal statement regarding same by any persons, prior to award, shall be unauthoritative.

Any explanation desired by bidders must be requested of the Design Professional in writing not less than five (5) days prior to the bidding date and, if explanation is necessary, a reply will be made in the form of an Addendum. A copy of the Addendum will be forwarded to each prospective bidder who has received a set of the Contract Documents and to such other interested parties as have requested that they be furnished with a copy of each Addendum.

All Addenda issued to bidders prior to date of receipt of bids shall become a part of the Contract Documents and all bids are to include the work therein described. Each Proposal submitted shall list all Addenda by numbers which have been received prior to time scheduled for receipt of bids.

All Bidders must submit questions using form AIA G716 "Request for Information (RFI)", or a format which contains substantially the same information and format. A sample of this form is included within the Appendix.

## **BONDS AND INSURANCE**

The successful bidder will be required to execute three bonds with sureties acceptable to the Owner; the **Performance Bond** to be executed to the Owner, to be in the amount of one hundred percent (100%) of the full Contract price and to be conditioned for the faithful fulfillment of the Contract and to include the protection of the Owner from all liens and damages arising out of the work; the **Labor and Material Bond** to be executed to the people of the state, to be in the amount of one hundred percent (100%) of the full Contract price and to be conditioned for the payment of all labor and materials used in the work and for the protection of the Owner from all liens and damages arising there from; and the **Maintenance and Guarantee Bond**, to be in the amount of one hundred percent (100%) of the Contract price.

The Worker's Compensation Insurance, Public Liability and Property Damage Insurance and Owner's Protective Public Liability Insurance in the amounts specified in the Agreement must be carried by the Contractor.

Each Proposal shall include the premium and all other charges, if any, for the Bonds and

Insurance herein described.

### **RIGHT TO ACCEPT, TO REJECT AND TO WAIVE DEFECTS**

The Owner reserves the right to accept any Proposal, to reject any or all Proposals, and to waive defects or irregularities in any Proposal. In particular, any alteration, erasure or interlineation of the contract documents and of the form of Proposal shall render the accompanying Proposal irregular and subject to rejection by the Owner unless initialed by the signatory prior to receipt of the Proposal.

### **WITHDRAWAL OF BIDS**

Any bidder who has submitted a Proposal to the Owner may withdraw his bid at any time prior to the scheduled time for the receipt of bids. No bidder may withdraw his bid after the time stated in the Advertisement for receiving bids, and his bid shall be firm and shall remain firm for a period of sixty (60) days thereafter.

### **TAXES**

The Contractor shall pay all use and other taxes that are lawfully assessed against the Contractor in connection with the work included in this Contract.

### **AWARD AND EXECUTION OF CONTRACT**

Contract shall be awarded to the lowest responsive and responsible bidder on the basis of the lowest total sum of the extended unit prices for items of work included in the Proposal. The contract shall be deemed as having been awarded when formal notice of award shall have been duly served by the Owner upon the bidder.

### **TIME OF COMPLETION**

The Owner and the individual citizens of the municipality affected by this project are vitally concerned with the prompt completion of the construction together with the cleanup and restoration of roads and lawns within the time allowed in the proposal.

The Contractor shall use sufficient labor and equipment to complete and place in service all of the work being constructed within this contract within the time specified in the proposal. The surface cleanup shall follow closely behind construction with earth spoil removed from lawns and roads and any trenches neatly finished by the end of each work day. **Failure of the Contractor to comply with this type of workmanlike job will result in the suspension of all contract operations until the cleanup is effected.**

If the Contractor shall be unavoidably delayed in beginning or fulfilling this contract by reason of excessive storm or floods, or by acts of Providence, or by general strikes, or by court injunction, or by stopping of the work by Owner because of any emergency or public necessity or by reason of alterations ordered by Owner, the Contractor shall have no valid claim for damages on account of any cause of delay; but he shall in such case be entitled to such an extension of the above time limit herein, as the Design Professional shall adjudge to be just and reasonable; provided, however, that formal claim for such extension shall be made in writing by the Contractor within a week after the date upon which such alleged cause or delay shall have occurred.

## **LIQUIDATED DAMAGES**

It is expressly covenanted and agreed that time is and shall be considered of the essence of the Contract. In the event that the Contractor shall fail to perform the entire work agreed to by or at the times herein mentioned in Article II and Article III of The Agreement, or within some other certain date subsequent to this to which the time limit for the completion of the work may have been advanced under the provisions of Article II of The Agreement, the Contractor shall pay unto the Owner as and for liquidated damages and not as a penalty, the sum of **Five Hundred Fifty Dollars (\$550.00)** for each and every calendar day that the Contractor shall be in default. Said sum of **Five Hundred Fifty Dollars (\$550.00)** per day, in view of the difficulty of estimating such damages with exactness, is hereby expressly fixed and agreed upon as the damages which will be suffered by the Owner for reason of such defaults. It is also understood and agreed that the liquidated damages herein before mentioned are, in lieu of the actual damages arising from such breaches of this Contract, which said sums the Owner shall have the right to deduct from any monies in hand otherwise due or to become due to the Contractor or to sue for and recover compensation for damages for nonperformance of this contract at the time stipulated herein and provided.

## **EXECUTION OF CONTRACT AND BOND FORMS**

The bidder to whom the contract shall have been awarded will be required to execute the Contract in the form attached hereto and to furnish surety and insurance certificates all as required within **ten (10) calendar days** from the date when notice of award is delivered to the bidder. The notice of award shall be accompanied by the necessary contract and bond forms as required by the General Supplementary Conditions. The notice to proceed shall be issued following the execution of the Contract by the Owner.

## **SOIL EROSION AND SEDIMENTATION CONTROL**

The Contractor shall make himself thoroughly familiar with the requirements of the Specifications in connection with prevention of soil erosion and sedimentation control.

The Contractor will be responsible for erosion control during the life of the Contract.

The Contractor shall designate a person who shall be responsible for soil erosion and sedimentation control during the life of the Contract.

## **MAINTAINING TRAFFIC**

The Contractor shall be responsible for maintaining traffic during the life of the Contract as required by the Specifications or as directed by the Design Professional.

## **PROGRESS PAYMENTS**

Progress payments to the Contractor will be made in accordance with State Act 524, Public Acts of 1980, a copy of which is included in the appendix.

Progress payments must be submitted using AIA form G702 Application for Payment and G703 Schedule of Values. Samples are provided within the Appendix.



**NON-COLLUSION AFFIDAVIT**

Bidders do not need to have the Non-Collusion Affidavit notarized but it must be submitted in order for a bid to be declared responsive.

## **SUPPLEMENTAL INSTRUCTIONS TO BIDDER**

**RECEIPT OF BIDS:** No bids will be accepted after the time specified for the bid opening. Bids will be available for examination immediately thereafter.

**DEPOSITS:** If a deposit is required, it must be a company certified check or bank cashier's check or bank money order (payable to Treasurer of the City of Southfield) or cash or a Michigan-licensed surety's bid bond. Should a bidder fail to furnish the required deposit with his bid, the bid will not be read and will not receive further consideration by the Owner.

**ADDITIONAL BIDS - ALTERNATIVE PRODUCTS:** If a bidder has more than one product meeting the specifications, he is privileged to offer additional bids. Such additional bids must be made separately from the original bid and are subject to the same terms and conditions of the original bid. Product brand names, if used herein, are intended to describe quality rather than preference. All proposed alternative products must be submitted using form CSI Substitution Request (During Bidding/Negotiation Stage) form, included in the appendix.

**WITHDRAWAL:** No bid shall be withdrawn for 60 days following the bid opening date. A Bidder may reduce this period if he so states in his proposal; however, the Owner reserves the right to declare such a bid non-responsive to the specifications.

**RIGHT TO REJECT:** The Owner reserves the right to waive any and all irregularities in the bids, to split the award by items or lots (unless otherwise stipulated in the specifications) or to award to other than the low bidder, should any of the foregoing be deemed in its best interests.

**CHANGE IN SPECIFICATIONS:** If a bidder wishes to request a revision in the specifications or an interpretation of the specifications, the request may receive consideration if presented to the Owner sufficiently in advance of the bid opening date. All proposed changes in specifications must be submitted using form CSI Substitution Request (During Bidding/Negotiation Stage) form, included in the appendix.. If a change in specifications is then made, the Owner will notify all bidders by registered mail and shall postpone the bid opening date, if necessary.

**SURETIES:** An approved surety bond to the Owner in an amount deemed adequate by the Owner may be required to guarantee performance. In certain cases described by state law, Act No. 213 of 1963, an additional bond to the State of Michigan is mandatory.

**FAILURE TO ENTER INTO CONTRACT:** If a bidder fails to formally acknowledge, accept, and execute the contract within **ten (10) calendar days** after delivery of the notice of award, the bid deposit shall be forfeited to the Owner.

**DEFAULT:** In the event of the Contractor's failure to deliver or perform in accordance with the contract, the Owner may consider the Contractor in default and take certain steps to protect its interests. The Owner may, without impairing its other rights and benefits, purchase all or part of the contract goods or services on the open market and charge all additional costs to the Contractor or his surety.

**DELIVERY:** F.O.B. City of Southfield, Michigan, designated location, freight prepaid.

**CONTAINER:** Packing, reels, etc., if chargeable, must be shown as separate items. Return freight must be paid by Contractor. Bids incorporating charge for returnable containers, etc., will

be considered an agreement to reimburse the Owner by check immediately on their return, regardless of other outstanding charges against the Owner, unless the charge is carried on a memo billing by the seller.

**WORKMANSHIP:** All materials furnished must be new or latest model and standard first grade quality, of best workmanship and design, unless otherwise expressly specified. Contractor shall if required, furnish satisfactory evidence of quality of materials. Offers of experimental or unproved equipment may not be considered.

**INSPECTION:** All costs arising from inspection, tests, and handling of materials failing to meet the specifications shall be the sole responsibility of the Contractor.

**PATENTS:** The Contractor shall protect and indemnify the Owner against all suits, costs, and damages which may result due to the use of any patented device, process, apparatus, material or invention during the performance of the work.

**NON-COLLUSION CLAUSE:** In signing and submitting this proposal, the bidder states that his bid is genuine and not collusive or a sham; such bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid, or that such other person shall refrain from bidding and has not in any manner, directly or indirectly, colluded, conspired, connived, or agreed, with any person, to fix the bid price of affiant or any other bidder, or to fix any overhead, profit or cost element of said bid price. Contractor shall be responsible for completing and submitting the Non-Collusion Affidavit included in the contract documents (page NCA-1).

**NON-DISCRIMINATION CLAUSE:** By signing and submitting this proposal for consideration by the Owner, the Contractor covenants not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions or privileges of employment or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, marital status or a handicap that is unrelated to the individual's ability to perform the duties of a particular job or position. Breach of this covenant may be regarded as a material breach of the contract.

**Permits:** The contractor shall be responsible for all permits required for construction. The Contractor is required to comply with all terms and conditions of the permit. All permit fees are assumed to be waived for this project.

Unless otherwise indicated, the Contractor must secure the permits prior to the start of construction. The Contractor shall also be responsible for arranging for inspection by the governing agencies.

Work cannot proceed until all permits are obtained.

## DOCUMENT 00 26 00 - PROCUREMENT SUBSTITUTION PROCEDURES

### 1.1 DEFINITIONS

- A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.
- B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 01 25 00 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

### 1.2 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

### 1.3 PROCUREMENT SUBSTITUTIONS

- A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.
- B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:
  - 1. Extensive revisions to the Contract Documents are not required.
  - 2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
  - 3. The request is fully documented and properly submitted.

### 1.4 SUBMITTALS

- A. Procurement Substitution Request: Submit to Architect . Procurement Substitution Request must be made in writing by prime contract Bidder only in compliance with the following requirements:
  - 1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
  - 2. Submittal Format: Submit electronic copy of each written Procurement Substitution Request, using form bound in Project Manual .
  - 3. Submittal Format: Submit Procurement Substitution Request, using format provided on Project Web site.
    - a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
    - b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:
      - 1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
      - 2) Copies of current, independent third-party test data of salient product or system characteristics.
      - 3) Samples where applicable or when requested by Architect.

- 4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
  - 5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - 6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from ICC-ES .
  - 7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.
- c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
  - d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 00 26 00



# SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_

From: \_\_\_\_\_

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

A/E Project Number: \_\_\_\_\_

Re: \_\_\_\_\_ Contract For: \_\_\_\_\_

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_

Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: \_\_\_\_\_

Signed by: \_\_\_\_\_

Firm: \_\_\_\_\_

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

Telephone: \_\_\_\_\_

## A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: \_\_\_\_\_

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

Supporting Data Attached:  Drawings  Product Data  Samples  Tests  Reports  \_\_\_\_\_

## ORDINANCE NO. 1478

AN ORDINANCE TO AMEND THE CODE OF THE CITY OF SOUTHFIELD BY ADDING A NEW CHAPTER, WHICH NEW CHAPTER SHALL BE DESIGNATED AS CHAPTER 14, LIVING WAGE REQUIREMENTS, OF TITLE I, ADMINISTRATION, OF SAID CODE.

THE CITY OF SOUTHFIELD ORDAINS:

### SECTION 1.

The Code of the City of Southfield is hereby amended by adding a new Chapter 14, Living Wage Requirements, to Title I, Administration, which shall read as follows:

#### Chapter 14: LIVING WAGE REQUIREMENTS.

##### Section 1.600. Purpose.

The purpose of this Ordinance is to improve the lives of working people and their families by requiring covered employers that provide contractual services to the City or that receive a tax abatement from the City to pay their covered employees a wage sufficient to meet basic subsistence needs, defined herein as a living wage.

##### Section 1.601. Definitions.

For purposes of this Chapter, the following definitions shall apply:

- (1.) Covered employer means a person that either:
  - (a.) Enters into a contract or contracts with the City primarily for the furnishing of services where the total amount of the contract or contracts, including related subcontracts, exceeds Fifty Thousand Dollars (\$50,000.00) for any twelve (12) month period. Covered employer includes a related subcontractor, but does not include a person that has a contract or subcontract primarily for the purchase or lease of goods or property by the City; or
  - (b.) Receives a tax abatement from the City.
- (2.) Covered employee means a person employed full-time by a covered employer to perform services in connection with the covered employer's contract or contracts with the City, including related subcontracts, or a person employed full-time by a covered employer at an office or facility which either has been granted a tax abatement or where personal property which has been granted a tax abatement is located.
- (3.) Federal poverty guideline shall mean the official poverty guideline issued annually by the United States Department of Health and Human Services for a family of four
- (4.)

- (4.) Health care benefits shall mean comprehensive, medical coverage for the covered employee fully paid for by the covered employer, whether provided on an insured or self-funded basis. Health care benefits may include membership in a health maintenance organization (HMO) or similar entity, if the membership or subscription fee is fully paid for by the covered employer.
- (5.) Living wage shall mean an hourly rate which, on an annual basis (based on forty [40] hours per week, fifty [50] weeks per year), is equivalent to either of the following:
  - (a.) One hundred and twenty-five percent (125%) of the federal poverty guideline, or
  - (b.) One hundred percent (100%) of the federal poverty guideline, if health care benefits are provided to the covered employee.
- (6.) Person shall mean any individual, firm, joint venture, partnership, corporation, club, and all associations or organizations of natural persons, either incorporated or unincorporated, however operating or named, and whether acting by themselves or by a servant, agent, or fiduciary, and includes all legal representatives, heirs, successors, and assigns thereof.
- (7.) Tax Abatement means a tax abatement approved by the City, pursuant to the Plant Rehabilitation and Industrial Development District Act, Public Act 198 of 1974, MCL 207.551, et seq.

#### Section 1.602. Living Wage Required.

- (1.) Every covered employer shall pay its covered employees and at least ninety percent (90%) of all the employees working on behalf of a covered employer in connection with a contract with the City no less than a living wage.
- (2.) In order to qualify to pay the living wage rate for covered employers providing employee health care benefits under Subsection 1.601(5)(b), a covered employer shall furnish proof of the health care benefits to the City.
- (3.) All City contracts covered by this Chapter shall provide that a violation of this Chapter shall be a material breach of the contract resulting in its termination.
- (4.) Any tax abatement covered by this Chapter shall be granted upon the condition that a violation of this Chapter shall result in its revocation.

#### Section 1.603. Monitoring of Compliance with this Chapter.

The City Purchasing Agent shall monitor compliance with the requirements of this Chapter, and shall notify all covered employers of any adjustment in the federal poverty level by March 1<sup>st</sup> of each year. If the living wage has increased, the covered employer shall begin paying the increased wage rate no later than April 1<sup>st</sup> of that year. The Purchasing Agent shall require all



covered employers to annually certify compliance with the requirements contained in Section 1.602 and all other provisions of this Chapter. In addition, any covered employer who is required to pay a living wage under Section 1.602 shall post a notice of such requirement in a conspicuous place in any work place where a covered employee is employed. The notice shall also state that, if the covered employer has failed to comply with the requirement of Section 1.602, a covered employee may file a notice of non-compliance with the Purchasing Agent. All City departments shall be provided with standard notices which set forth the requirements of this Chapter for inclusion in the solicitation of proposals, bids, or applications for City contracts. Departments shall include said notices in their RFP's, RFQ's, specifications, and notices inviting bids or any other solicitations for contracts.

#### Section 1.604. Notice of Non-Compliance.

Any covered employee of a covered employer, who believes the covered employer has failed to comply with this Chapter, may file a notice with the Purchasing Agent. The Purchasing Agent, based on such notice or on his or her own initiative if a possible violation of this Chapter is discovered by other means, shall forward a notice to the covered employer by first class mail describing the violation; requesting the submission of proof of compliance within thirty (30) days of mailing, and indicating that failure to do so shall result in the termination of its contract or tax abatement. This Chapter shall not be construed to limit a covered employee's right to bring legal action for violation of any other minimum compensation or wage and hour law.

#### Section 1.605. Non-Compliance.

In the event the Purchasing Director determines that a covered employer has failed to comply with the provisions of this Chapter and the covered employer has failed to rectify the non-compliance within thirty (30) days of the mailing of the notice provided for in Section 1.604, the City shall take appropriate action to terminate its contract or tax abatement.

#### Section 1.606. Exemptions from Application of this Chapter.

The following exemptions from compliance with this Chapter shall apply:

- (1.) The provisions of this Chapter shall not apply to a contract with another unit of government.
- (2.) The provisions of this Chapter shall not apply to a covered employee who is:
  - (a.) younger than eighteen (18) years of age;
  - (b.) employed during summer months in a student or youth employment program;
  - (c.) engaged in any training program, not to exceed a time period of ninety (90) days, that qualifies the person either to begin employment with the covered employer or to receive an employment promotion within the covered employer; or
  - (d.) engaged or participating in a bona fide, student internship program.

- (3.) The provisions of this Chapter shall not apply where a covered employee is subject to the terms of a collective bargaining agreement.
- (4.) The provisions of this Chapter shall not apply where federal or state law requires the payment of a prevailing wage.
- (5.) A non-profit covered employer, which is recognized by the Internal Revenue Service as tax exempt under the Internal Revenue Code, shall be exempt from the provisions of this Chapter, provided that this exemption shall only apply to a non-profit, covered employer if it employs ten (10) or fewer employees on a continuous basis. A continuous basis is defined as employing ten (10) or fewer employees on each working day in each of twenty (20) or more calendar weeks in the current or preceding year.
- (6.) The provisions of this Chapter shall not apply to contracts entered into or tax abatements approved prior to the effective date of this Chapter.

Section 1.607. Exemptions determined by City Council.

The City Council may grant a partial or complete exemption from the requirements of this Chapter if it determines one (1) of the following:

- (1.) The application of this Chapter would violate federal, state, or local law(s); or
- (2.) The application of this Chapter to a non-profit, covered employer, recognized as tax exempt under the Internal Revenue Code, would not be in the best interest of the City.

Section 1.608. Change in Status of Employees.

No affected covered employer shall reduce the compensation, wages, fringe benefits, or leave available to any covered employee or other employee in order to pay the living wage required by this Chapter.

Section 1.609. Annual Report.

The City Administrator shall submit an annual report to the City Council and the Mayor with regard to the operation of this Chapter. The report shall contain a listing and the status of all contracts and tax abatements to which this Chapter applies, including the term; dollar amount; the services performed or assistance provided; a summary of all violations of this Chapter; adjustments to the living wage, if any; a description of any administrative problems encountered; and recommendations for more efficient and effective administration of the provisions of this Chapter.

Section 1.610. Penalty.

- (1.) A violation of any provision of this Chapter is a civil infraction punishable by a fine of not more than Five Hundred Dollars (\$500.00), plus all costs of the action. The Court may issue and enforce any judgment, writ, or order necessary to enforce this

Chapter, including payment to the affected covered employee or employees of the difference between wages actually paid and the living wage that should have been paid, interest, and other relief deemed appropriate.

- (2.) Each day, upon which a violation occurs, shall constitute a separate violation.

*SECTION 2.*

Should any section, clause, or paragraph of this Ordinance be declared by a court of competent jurisdiction to be invalid, the same will not affect the validity of the Ordinance as a whole or part thereof other than the part declared to be invalid.

*SECTION 3.*

All ordinances, parts of ordinances, or codes in conflict herewith are hereby repealed only to the extent necessary to give this Ordinance full force and effect.

*SECTION 4.*

This Ordinance shall become effective on September 8, 2002.

KENSON J. SIVER, Mayor

ALLYSON BETTIS, City Clerk

Introduced: 07-22-02

Enacted: 08-26-02

Published: 09-08-02

**NOTICE OF EMPLOYERS OBLIGATION  
TO COMPLY WITH LIVING WAGE ORDINANCE  
OF THE CITY OF SOUTHFIELD**

This Employer is required to pay a “living wage” under Section 1.602 of the Southfield City Code to “covered employees” performing services in connection with a contract between the Employer and the City of Southfield.

If any covered employee believes this Employer has failed to comply with Section 1.602 of the Southfield City Code, he or she may file a notice of non-compliance with the City of Southfield Purchasing Agent (248-796-5250).

The Employer shall not reduce the compensation, wages, fringe benefits, or leave available to any covered employee or other employee in order to pay the living wage required by the Ordinance.

The Living Wage Ordinance does not limit a covered employee’s right to bring legal action for violation of any other minimum compensation or wage and hour law.

**Supplemental Specification:  
City of Southfield Living Wage Ordinance**

The Contractor shall comply with the terms of the City of Southfield “Living Wage Ordinance”, Chapter 14 of Title I, of the Code of the City of Southfield (the “Ordinance”).

The Contractor shall pay its “covered employees” (a person employed full-time to perform services in connection with the Contractor’s contract(s) with the City, including related subcontracts) and at least 90% of all the employees working on behalf of the Contractor in connection with a contract with the City, no less than a “Living Wage”.

A “Living Wage” means an hourly rate which, on an annual basis (based on forty hours per week, fifty weeks per year) is equivalent to either of the following:

- a) One Hundred Twenty-Five percent (125%) of the federal poverty guideline, or
- b) One Hundred percent (100%) of the federal poverty guideline if Health Care Benefits are provided to the covered employee - (“Health Care Benefits” means comprehensive, medical coverage for the covered employee fully paid for by the Contractor, whether provided on an insured or self-funded basis. “Health Care Benefits” may include membership in a health maintenance organization (HMO) or similar entity, if the membership or subscription fee is fully paid by the Contractor).

The Contractor shall be required to certify both at the commencement of the Contract and upon request for final contract payment that it is in compliance with the requirements of the Living Wage Ordinance.

The Contractor shall post a notice of its obligation to comply with the Living Wage Ordinance in a conspicuous place in any work place where a covered employee is employed. The notice shall also state that if the Contractor has failed to pay a living wage to a covered employee, such employee may file a notice of non-compliance with the City of Southfield Purchasing Agent. The Purchasing Agent, based on such notice, or, on his or her own initiative if a possible violation of the Ordinance is discovered by other means, shall forward a notice to the Contractor by first class mail describing the violation, requesting the submission of proof of compliance within thirty (30) days of mailing. Failure by the Contractor to submit proof of compliance within such thirty (30) day period shall result in termination of the Contract.

In addition, a violation of the Ordinance is a civil infraction, punishable by a fine of not more than \$500.00 plus all costs of the action. The Court may issue and enforce any judgment, writ, or order necessary to enforce the Ordinance, including payment to the affected covered employee or employees of the difference between wages actually paid and the living wage that should have been paid, plus interest, and other relief deemed appropriate.

The Contractor shall not reduce the compensation, wages, fringe benefits, or leaves available to any covered employee or other employee in order to pay the living wage required by the Ordinance.

The following exemptions from compliance with the Ordinance shall apply:

1. The provisions of the Ordinance shall not apply to a contract with another unit of government.
2. The provisions of the Ordinance shall not apply to a covered employee who is:
  - (a) younger than (18) years of age;
  - (b) employed during summer months in a student or youth employment program;
  - (c) engaged in any training program, not to exceed a time period of ninety (90) days, that qualifies the person either to begin employment with the covered employer or to receive an employment promotion within the covered employer; or
  - (d) engaged or participating in a bona fide, student internship program.
3. The provisions of the Ordinance shall not apply where a covered employee is subject to the terms of a collective bargaining agreement.
4. The provisions of the Ordinance shall not apply where federal or state law requires the payment of a prevailing wage.
5. A non-profit covered employer, which is recognized by the Internal Revenue Service as tax exempt under the Internal Revenue Code, shall be exempt from the provisions of the Ordinance, provided that this exemption shall only apply to non-profit, covered employer if it employs ten (10) or fewer employees on a continuous basis. A continuous basis is defined as employing ten (10) or fewer employees on each working day in each twenty (20) or more calendar weeks in the current or preceding year.
6. The provisions of the Ordinance shall not apply to contracts entered into prior to the effective date of this Chapter.

### **2023 Applicable Living Wage Rates**

For employees <u>not</u> covered under health care benefits	<b>\$16.68/hour</b>
For employees covered under health care benefits	<b>\$13.34/hour</b>

**HAZARD COMMUNICATION PROGRAM - CONTRACTOR'S POLICY STATEMENT**

The City of Southfield complies with the Michigan Right to Know Law (MIOSHA). The City's written Hazard Communication Program is available upon request in the Office of Management and Budget as is our master Material Safety Data Sheets (MSDS) binder. The City Policy and master MSDS binder may be viewed at any time by both contractors and their employees performing work on City owned or operated premises.

**NOTE:** Time required by contractors (and their employees) to review the City Policy or Material Safety Data Sheets is **NOT** chargeable to the City of Southfield.

In addition, the successful bidder must comply with Public Act 4111 Hazard Communications (Employee Right to Know) Act by providing material safety data sheets (MSDS) to the City of Southfield prior to commencing any work.

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NAME OF BIDDER

---

AUTHORIZED SIGNATURE

**CITY OF SOUTHFIELD**

**NON-COLLUSION AFFIDAVIT**

County                    )  
                                  SS:  
                                  )

\_\_\_\_\_ being first duly Sworn,  
deposes and says that he is the \_\_\_\_\_  
                                  (Individual, Partner, Corporate Officer)

making the foregoing proposals or bids; that such bids are genuine and not collusive or sham; such bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid, or that such other person shall refrain from bidding and has not in any manner, directly with any person, to fix the bid price of affiant or any other bidder, or to fix any overhead, profit or cost element of said bid price, or of that of any other bidder, or to secure any advantage against the City of Southfield or any person or persons interested in the proposed bids; and that all statements contained in said proposal are true; and further, that such bidder has not, directly or indirectly submitted this bid, or the contents thereof, or divulged information or data relative thereto to any association or to any member or agent thereof.

Affiant

Sworn to and subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
My Commission Expires:



**LEGAL STATUS OF BIDDER**

A corporation duly organized and doing business under the laws of the State of \_\_\_\_\_ for whom \_\_\_\_\_, bearing the official title of \_\_\_\_\_, whose signature is affixed to this Proposal, is duly authorized to execute contracts.

A partnership all of the members of which, with addresses, are:

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An individual, whose signature is affixed to this Proposal.

(The BIDDER shall fill out the appropriate form and strike out the other two.)

DOCUMENT 004113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 BID INFORMATION

- A. Bidder: \_\_\_\_\_.
- B. Project Name: DPW Storage Building Addition
- C. Project Location: 25501 Clara Lane, Southfield, Michigan, 49034.
- D. Owner: City of Southfield.
- E. Architect: OHM Advisors.
- F. Architect Project Number: 0153-22-0070 .

1.2 CERTIFICATIONS AND BASE BID

- A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by OHM Advisors and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:

- 1. \_\_\_\_\_ Dollars (\$ \_\_\_\_\_).
- 2. The above amount may be modified by amounts indicated by the Bidder on the attached Document 004322 "Unit Prices Form" and Document 004323 "Alternates Form."

1.3 ACKNOWLEDGEMENT OF ADDENDA

- A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:
  - 1. Addendum No. 1, dated \_\_\_\_\_.
  - 2. Addendum No. 2, dated \_\_\_\_\_.
  - 3. Addendum No. 3, dated \_\_\_\_\_.
  - 4. Addendum No. 4, dated \_\_\_\_\_.

1.4 BID SUPPLEMENTS

- A. The following supplements are a part of this Bid Form and are attached hereto.
  - 1. Bid Form Supplement - Alternates.
  - 2. Bid Form Supplement – Unit Prices

1.5 CONTRACTOR'S LICENSE

- A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in City of Southfield , and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.6 SUBMISSION OF BID

- A. Respectfully submitted this \_\_\_\_ day of \_\_\_\_\_, 2023 .
- B. Submitted By: \_\_\_\_\_(Name of bidding firm or corporation).
- C. Authorized Signature: \_\_\_\_\_(Handwritten signature).
- D. Signed By: \_\_\_\_\_(Type or print name).
- E. Title: \_\_\_\_\_(Owner/Partner/President/Vice President).
- F. Witnessed By: \_\_\_\_\_(Handwritten signature).
- G. Attest: \_\_\_\_\_(Handwritten signature).
- H. By: \_\_\_\_\_(Type or print name).
- I. Title: \_\_\_\_\_(Corporate Secretary or Assistant Secretary).
- J. Street Address: \_\_\_\_\_.
- K. City, State, Zip: \_\_\_\_\_.
- L. Phone: \_\_\_\_\_.
- M. License No.: \_\_\_\_\_.
- N. Federal ID No.: \_\_\_\_\_(Affix Corporate Seal Here).

END OF DOCUMENT 004113

DOCUMENT 00 43 22 - UNIT PRICES FORM

1.1 BID INFORMATION

- A. Bidder: \_\_\_\_\_.
- B. Project Name: DPW Storage Building.
- C. Project Location: 25501 Clara Lane, Southfield, Michigan, 48034.
- D. Owner: City of Southfield.
- E. Architect: OHM Advisors.
- F. Architect Project Number: 0153220070

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.
- B. The undersigned Bidder proposes the amounts below be added to or deducted from the Contract Sum on performance and measurement of the individual items of Work
- C. If the unit price does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."

1.3 UNIT PRICES

- A. Unit-Price No. 1: Existing Material, Excavation and Haul-Off.
  - 1. \_\_\_\_\_ dollars (\$ \_\_\_\_\_) per unit.
- B. Unit-Price No. 2: Engineered Fill, CI II Sand, Placement and Compaction.
  - 1. \_\_\_\_\_ dollars (\$ \_\_\_\_\_) per unit.

1.4 SUBMISSION OF BID SUPPLEMENT

- A. Respectfully submitted this \_\_\_\_ day of \_\_\_\_\_, 2023.
- B. Submitted By: \_\_\_\_\_ (Insert name of bidding firm or corporation).
- C. Authorized Signature: \_\_\_\_\_ (Handwritten signature).
- D. Signed By: \_\_\_\_\_ (Type or print name).
- E. Title: \_\_\_\_\_ (Owner/Partner/President/Vice President).

END OF DOCUMENT 00 43 22

DOCUMENT 004323 - ALTERNATES FORM

1.1 BID INFORMATION

- A. Bidder: \_\_\_\_\_.
- B. Project Name: DPW Storage Building Addition
- C. Project Location: 25551 Clara Lane, Southfield, MI 49034.
- D. Owner: City of Southfield.
- E. Architect: OHM Advisors.
- F. Architect Project Number: 0153-22-0070.

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.

1.3 DESCRIPTION

- A. The undersigned Bidder proposes the amount below be added to or deducted from the Base Bid if particular alternates are accepted by Owner. Amounts listed for each alternate include costs of related coordination, modification, or adjustment.
- B. If the alternate does not affect the Contract Sum, the Bidder shall indicate "NO CHANGE."
- C. If the alternate does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."
- D. The Bidder shall be responsible for determining from the Contract Documents the affects of each alternate on the Contract Time and the Contract Sum.
- E. Owner reserves the right to accept or reject any alternate, in any order, and to award or amend the Contract accordingly within 60 days of the Notice of Award unless otherwise indicated in the Contract Documents.
- F. Acceptance or non-acceptance of any alternates by the Owner shall have no affect on the Contract Time unless the "Schedule of Alternates" Article below provides a formatted space for the adjustment of the Contract Time.

1.4 SCHEDULE OF ALTERNATES

- A. Alternate No. 01 : Add Additional 21' Bay to Building End.
  - 1. ADD \_\_\_ DEDUCT \_\_\_ NO CHANGE \_\_\_ NOT APPLICABLE \_\_\_.
  - 2. \_\_\_\_\_ Dollars  
(\$ \_\_\_\_\_).
  - 3. ADD \_\_\_ DEDUCT \_\_\_ calendar days to adjust the Contract Time for this alternate.

- B. Alternate No. 02 : High Performance Coating Floor Finish.
1. ADD \_\_\_ DEDUCT \_\_\_ NO CHANGE \_\_\_ NOT APPLICABLE \_\_\_.
  2. \_\_\_\_\_ Dollars  
(\$ \_\_\_\_\_).
  3. ADD \_\_\_ DEDUCT \_\_\_ calendar days to adjust the Contract Time for this alternate.

1.5 SUBMISSION OF BID SUPPLEMENT

- A. Respectfully submitted this \_\_\_ day of \_\_\_\_\_, 2023 .
- B. Submitted By: \_\_\_\_\_ (Insert name of bidding firm or corporation).
- C. Authorized Signature: \_\_\_\_\_ (Handwritten signature).
- D. Signed By: \_\_\_\_\_ (Type or print name).
- E. Title: \_\_\_\_\_ (Owner/Partner/President/Vice President).

END OF DOCUMENT 004323

## AGREEMENT

THIS AGREEMENT, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_ by and between the **City of Southfield**, party of the First Part, hereinafter called the OWNER and \_\_\_\_\_, party of the Second Part, hereinafter called THE CONTRACTOR.

WITNESSETH, that the CONTRACTOR and OWNER, for the consideration hereinafter named agree as follows:

### ARTICLE I - WORK

It is agreed that the CONTRACTOR shall furnish all the labor, materials, and equipment to perform all the work shown and called for on the Drawings and described in the Contract Documents entitled **Southfield DPW Storage Building Addition** prepared by **Orchard Hiltz & McCliment, Inc.**, acting as, and in these Contract Documents entitled, the DESIGN PROFESSIONAL, and shall do everything required by the Contract Documents. The Contract Documents being hereby defined to include the Agreement, Bonds, Drawings, Advertisement, Instructions to Bidders, Specifications and any Supplements thereto agreed to by both parties.

If applicable, it is further agreed that the work shall be done using the following named materials and types of construction offered either in the base proposal or alternate thereto.

### ARTICLE II - TIME

It is agreed that the CONTRACTOR shall begin work under this Contract within **10 days** of receipt of written notice to proceed and shall prosecute it in such manner that the entire work of this contract shall be complete by **November 1, 2024**, except as such time limits may be advanced in accordance with the provisions herein. The time of beginning, rate of progress and date of completion are considered essential elements of the Contract.

It is agreed that if the CONTRACTOR shall be unavoidably delayed in beginning or fulfilling this contract by reason of excessive storm or floods, or by acts of Providence, or by general strikes, or by court injunction, or by stopping of the work by OWNER because of any emergency or public necessity or by reason of alterations ordered by OWNER, the CONTRACTOR shall have no valid claim for damages on account of any cause of delay; but he shall in such case be entitled to such an extension of the above time limit herein, as the DESIGN PROFESSIONAL shall adjudge to be just and reasonable; provided, however, that formal claim for such extension shall be made in writing by the CONTRACTOR within a week after the date upon which such alleged cause or delay shall have occurred.

### ARTICLE III - LIQUIDATED DAMAGES

It is expressly covenanted and agreed that time is and shall be considered of the essence of the Contract. In the event that the CONTRACTOR shall fail to perform the entire work agreed to by or at the times herein mentioned as referenced to in Article II, or within some other certain date subsequent to this to which the time limit for the completion of the work may have been advanced under the provision of Article II, the CONTRACTOR shall pay unto the OWNER as and for Liquidated Damages and not as a penalty, the sum of **Five hundred and fifty Dollars (\$550.00)** for each and every calendar day that the CONTRACTOR shall be in default. Said sum of **Five**

**hundred fifty Dollars (\$550.00)** per day, in view of the difficulty of estimating such damages with exactness, is hereby expressly fixed and agreed upon as the damages which will be suffered by the OWNER for reason of such defaults. It is also understood and agreed that the Liquidated Damages herein before mentioned are in lieu of the actual damages arising from such breaches of this Contract, which said sums the OWNER shall have the right to deduct from any monies in his hand otherwise due or to become due to the CONTRACTOR or to sue for and recover compensation for damages for nonperformance of this contract at the time stipulated herein and provided. Provided, however, it is understood and agreed that the foregoing provisions of this Article are without prejudice to any other right or remedy which the OWNER may have under this Agreement.

#### **ARTICLE IV - OWNER'S RIGHT TO COMPLETE**

It is agreed that if at any time the CONTRACTOR should abandon this work; or if he should be adjudged as bankrupt, or if his performance of this Contract is being unnecessarily or unreasonably delayed; or if he should make a general assignment for the benefit of his creditors; or if a receiver should be appointed on account of his insolvency or if he should persistently or repeatedly fail to supply enough properly skilled workmen or sufficient suitable materials for the work; or if he should habitually fail to make prompt payment to SUBCONTRACTORS or to pay promptly for materials and labor; or if he should persistently disregard laws or ordinances or the directions of the DESIGN PROFESSIONAL; or if he should willfully violate any of the substantial provisions of this Agreement as shall be determined by the OWNER; then in such case the OWNER, after giving the CONTRACTOR and his sureties written notice thereof, may order him to discontinue all work under this contract, or any part thereof, and shall cease to have any right to the possession of the ground. The OWNER shall have the right to finish the work, or part thereof, by contract or otherwise as he may elect, and for that purpose to take possession and make use of such materials, tools, building appliances and equipment as may be found upon the work, and to charge the cost and expense of such completion to the CONTRACTOR. The CONTRACTOR shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract price shall exceed the expense of finishing the work, including compensation for additional managerial and administrative services, the amount of such excess shall be paid to the CONTRACTOR; and if such expense shall exceed such unpaid balance, the CONTRACTOR and/or his surety shall pay the OWNER the amount of such excess.

It is expressly stipulated and agreed that from and after the date of the order to discontinue work, and until such work shall have been finally completed by the OWNER, neither the CONTRACTOR nor any of his agents or employees shall remove, or make any effort directly or indirectly to remove, any of the above mentioned materials, tools, building appliances or equipment from the work without consent of the OWNER to do so.

It is further understood and agreed that the foregoing provisions of this article are without prejudice to any other right or remedy which the OWNER may have under this Agreement.

#### **ARTICLE V - ASSIGNMENT OF CONTRACT**

It is agreed that the CONTRACTOR shall not assign or transfer this Contract or sublet any part of the work embraced in it except with the written consent of the OWNER to do so.

It is further agreed that all parts of the work which may be performed by a SUBCONTRACTOR shall be done in conformity with and be subject to all the provisions of the Contract Documents exactly as if performed by the CONTRACTOR and his immediate employees and workmen. No



subletting of the work shall in any way diminish or weaken the responsibility of the CONTRACTOR for all parts of the work or lessen his obligations and liabilities under this Agreement.

It is likewise agreed that the CONTRACTOR shall not assign, either legally or equitably, any of the monies payable to him under this Agreement, or his claim thereto, except with the written consent of the OWNER.

#### **ARTICLE VI - THE CONTRACT SUM**

And it is agreed that, in consideration of the faithful and entire performance by the CONTRACTOR of his obligations under this Contract, the OWNER shall pay to him, at the time and in the manner hereinafter stipulated, an amount of:

**NET TOTAL BID AMOUNT: \$ \_\_\_\_\_**

Such an amount shall be modified by such sums for alterations as may have been determined under the provisions of Article XI herein and diminished by such sums as the OWNER may lawfully deduct and retain under the provisions of Article III and Article IV of this Agreement.

#### **ARTICLE VII - NO ESTOPPEL**

The OWNER shall not, nor shall any agent thereof, be precluded or stopped by any progress estimate for payment or certificate, made or given by the DESIGN PROFESSIONAL, or other agent, under the provisions of this agreement, at any time (either before or after the final completion and acceptance of the work and payment made thereof pursuant to any such progress estimate for payment or certificate showing the true and correct amount of any money due therefore, notwithstanding any such progress estimate for payment or certificate, or any payment made in accordance therewith) from demanding and receiving from the CONTRACTOR or his Sureties, separately or collectively, such sums as may have been improperly paid said CONTRACTOR by reason of any such progress estimate for payment or certificate which has been untruly or incorrectly compiled.

#### **ARTICLE VIII - PAYMENT TO CONTRACTOR**

A. Contract Value Less than \$30,000.00 or Contract with Provision for 3 or Fewer Payments or Contract for Private Work

After the close of each month during which satisfactory progress has been made toward the final completion of the work, or when a specified time or phase of the work has been completed according to previous agreement or contract specifications, the DESIGN PROFESSIONAL will make an estimate of the amount and value of the work which has been done under this contract during that month, time period or since the date of the last preceding estimate. Such estimate shall not be required to be made by strict measurement or with exactness, but may be made by estimation, and it shall be sufficient if it is approximate only. Any error or inaccuracy which may occur in any such progress estimate may be allowed for or corrected in any subsequent estimate.

It is agreed that before the CONTRACTOR shall receive payment, he shall furnish to the OWNER, if so requested, satisfactory evidence that all persons who have supplied labor, material, or equipment for the work embraced under this Contract have been fully paid for the same; and that in case such evidence is not furnished, such sums as the OWNER may

deem necessary to meet the lawful claims of such persons may be retained by the OWNER from any monies that may be due to the CONTRACTOR under this Agreement until such liabilities shall be fully discharged and the evidence thereof be furnished to the OWNER.

As soon as practical, but not longer than 30 days, after such estimate is certified to the OWNER by the DESIGN PROFESSIONAL, the OWNER shall pay to the CONTRACTOR a sum equal to ninety percent (90%) of the amount of such estimate; except that the OWNER may deduct and retain out of any such partial payment a sum sufficient to meet any undischarged obligations of the CONTRACTOR for labor, materials or equipment furnished for the work when such lawful claims are made known to the OWNER.

The progress estimate and payment thus provided for will include all alterations which may be done under the provisions of Article XI on the same basis as other work is included. All such work is regarded herein as essentially a part of the Contract and not merely an addition to it.

In the case of equipment or other building material, but not including sewer pipe or water main and appurtenances associated therewith, properly stored and protected on the site, the DESIGN PROFESSIONAL may make allowance in the estimate of 75% of the value of such items.

No progress estimate made or certified by the DESIGN PROFESSIONAL and no partial payment made to the CONTRACTOR by the OWNER shall be deemed or construed as an acceptance of any part of the work under this contract.

As soon as practicable after the satisfactory completion of all work covered by this Agreement, the DESIGN PROFESSIONAL will make a final inspection of the work as a whole, and will make up a final estimate of the total amount due the CONTRACTOR under the terms of the Agreement. Upon the acceptance of the completed work, the OWNER will pay to the CONTRACTOR the entire amount of such final estimate, less the sums previously paid, and less such sums as the OWNER may deem to be necessary to meet the undischarged obligations of the CONTRACTOR. The CONTRACTOR shall file with the OWNER (1) a sworn statement that all claims for amounts due for labor have been paid in full, and (2) a sworn statement that all claims for amounts due for materials and equipment for this work have been paid in full, or he shall so file in lieu thereof, a sworn statement and waiver of lien showing in detail the nature and amount of all unpaid claims for said labor, materials and equipment.

B. Contract Value Greater than \$30,000.00 and Not Limited to 3 or Fewer Payments

Payment for contracts meeting the above criteria shall be regulated by P.A. No. 524 of 1980, effective January 1, 1983, and the following reference(s) to Section(s) and subsection(s) refer to this act.

\_\_\_\_\_ is hereby designated as the  
(Print or Type Name)  
person representing the CONTRACTOR who will submit written requests for progress payments;

\_\_\_\_\_ is hereby designated as the  
(Print or Type Name)

person representing the public agency (OWNER) to whom requests for progress payments are to be submitted.

Written requests for progress payments shall be submitted after the close of each month during which satisfactory progress has been made toward the final completion of the work. Requests for payment shall conform to the established practices of the OWNER and shall be made on standard forms prepared and/or furnished by the OWNER. Progress payments shall be processed within the guidelines and applicable time limits set forth in Section 2.

Retention of a portion of payment otherwise due, when deemed appropriate by the OWNER, shall not exceed the limits set forth in Section 3 (2); all such retainage to be maintained in separate financial accounts for each contract, deposited in interest bearing accounts in regulated financial institutions, when appropriate and as specified in Section 3 (3). Retainage and interest earned shall be released to the CONTRACTOR as set forth in Section 3 (4) and 3 (5), with exceptions as provided.

The progress payments thus provided for will include all alterations which may be done under the provisions of Article XI on the same basis as other work is included. All such work is regarded herein as essentially a part of the Contract and not merely an addition to it.

In the case of equipment or other building materials, but not including sewer pipe or water main and appurtenances associated therewith, properly stored and protected on the site, the DESIGN PROFESSIONAL may make allowance in the estimate of 75% of the value of such items.

No progress payment made or certified by the DESIGN PROFESSIONAL and no partial payment made to the CONTRACTOR by the OWNER shall be deemed or construed as an acceptance of any part of the work under this contract.

It is agreed that the OWNER may submit matters of dispute regarding a delay, for reasons that were within the control of the CONTRACTOR, or which have been caused, continued or aggravated by actions of the CONTRACTOR, to an agent who has background, training and experience in construction of similar facilities for resolution, as set forth in Section 4. The OWNER and the CONTRACTOR shall be bound by the guidelines established for the resolution of disputes therein defined and by the subsequent guidelines established for the completion of the contract by a SUBCONTRACTOR selected by the OWNER for occasions arising from the specified disputes.

As soon as practicable after the satisfactory completion of all work covered by this Agreement, the DESIGN PROFESSIONAL will make a final inspection of the work as a whole. The CONTRACTOR shall submit a written request for final progress payment to the OWNER and the OWNER will pay to the CONTRACTOR the entire amount of such final estimate including retainage and interest earned on retainage, less the sums previously paid, and less such sums as the OWNER may rightfully retain as provided for in Section 4 (7) and 4 (8). The CONTRACTOR shall file with the OWNER (1) a sworn statement that all claims for amounts due for labor have been paid in full, and (2) a sworn statement that all claims for amounts due for materials and equipment furnished for this work have been paid in full, or he shall so file in lieu thereof, a sworn statement showing in detail the nature and amount of all unpaid claims for said labor, materials and equipment.

## **ARTICLE IX - INDEMNITY & RELEASE**

The CONTRACTOR hereby releases and covenants not to sue the City of Southfield, Michigan, its agents, employees and officers, and shall indemnify and hold harmless the City of Southfield, Michigan, its officers, employees and agents from and against any and all liability, causes of action, claims, demands, judgments, losses, damages and/or expenses, of whatsoever kind or nature, including attorney's fees and expert witness fees, and including claims for injury, mental or physical, or death to any person and/or damage to or destruction or loss of any property, real or personal, materials or equipment, (including, without limitation, damage to or destruction or loss of the City's property, materials or equipment) resulting, directly or indirectly, from or in connection with the CONTRACTOR's, or its agents', officials' or employees', performance of the Contract work, including, but not limited to:

- a.) Any negligent or tortious act, error or omission of the CONTRACTOR or any of its personnel, employees, SUBCONTRACTORS, or agents;
- b.) Any claim for any infringement upon any patent, copyright, trade secret, or trademark resulting from the performance of the Contract;
- c.) Any failure by the CONTRACTOR or any of its personnel, employees, consultants, or SUBCONTRACTORS to perform its obligations either expressed or implied under this Contract.

In the event that any action or proceeding shall be brought against the City of Southfield, and/or its agents, officials, or employees, by reason of any claim covered hereunder, the CONTRACTOR will, at its sole cost and expense, resist or defend the same.

This Article shall survive the expiration or termination of the Contract.

The CONTRACTOR expressly agrees that this indemnification and release provision is intended to be as broad and inclusive as is permitted by law and that if any portion thereof is held invalid, it is agreed that the balance shall, notwithstanding, continue in full legal force and effect.

## **ARTICLE X - AMENDMENTS**

The parties to this Contract may, from time to time, consider it in their best interest to change, modify or extend a term, condition or covenant of this Contract or require changes in the scope of the services to be performed by the CONTRACTOR. Any such change, addition, deletion, extension or modification, including any increase or decrease in the amount of the CONTRACTOR's compensation, which are mutually agreed upon by and between OWNER and the CONTRACTOR shall be incorporated in written amendments (herein called "Amendments") to this Contract. Such Amendments shall not invalidate this Contract, nor relieve or release the CONTRACTOR of any of its obligations under this Contract unless expressly stated therein.

No Amendment to this Contract shall be effective and binding upon the parties hereto, unless it expressly makes reference to this Contract, is in writing and is signed and acknowledged by duly authorized representatives of both parties.

## **ARTICLE XI - ALTERATIONS**

It is agreed that the CONTRACTOR shall make alterations to the work under this Contract as OWNER may especially order in writing. Such alterations shall be paid for at prices mutually agreed upon at the time by OWNER and the CONTRACTOR or using one or more of the methods

set forth in Section 22 of the General Conditions.

In the case of additions only, where a price cannot be agreed upon in advance, then the OWNER will pay and the CONTRACTOR shall accept, as full compensation for such work, an amount equal to the actual and necessary net cost in money for the CONTRACTOR for labor, materials and equipment (in addition to that available at the site) actually used therein or expended thereon, plus thirty percent (30%) of the total labor cost, plus ten percent (10%) of the actual net material cost, plus sales tax, plus ten percent (10%) of the actual net cost of any subcontract work for supervision, power, the use of tools and facilities available at the site, taxes, insurance, bond premium and all overhead and incidental expenses.

During the progress of any extra work which is to be paid for on the basis of net cost plus stipulated percentage, the CONTRACTOR shall furnish to OWNER, at the end of each day, suitable time slips showing the name and the number of hours worked by each worker employed thereon, the nature of the work performed by such worker, and his rate of pay together with suitable and adequate memoranda of the materials used therein showing the character and amount of each such material, the sources from which it was purchased, and the price paid or to be paid therefore.

The OWNER, at his discretion, may furnish to the CONTRACTOR any materials or supplies or transportation required for extra work. The CONTRACTOR shall not be entitled to any allowance for percentage on account of materials or supplies or transportation so furnished.

It is agreed that all work that may be ordered by the OWNER and performed under the provisions of this Article shall be done by the CONTRACTOR in an effective and workmanlike manner and shall be subject to the same restrictions and liabilities as those which apply to the general work of this Contract; and the CONTRACTOR will be responsible for the maintenance and protection of such work until the time of the final acceptance of the entire job by the OWNER.

It is further agreed that no claim against the OWNER on account of alterations shall be valid unless such work has been previously ordered in writing, and unless such claim has been presented for payment as soon as practicable after the completion of such work and before the making up of the final estimate.

#### **ARTICLE XII - CONFLICT OF INTEREST**

The CONTRACTOR hereby warrants that it will not and has not, employed any employee of the OWNER to solicit or secure this Contract upon any agreement or arrangement for payment of a commission, percentage, brokerage, or contingent fee, either directly or indirectly and that if this warranty is breached, the OWNER at his election may terminate this Contract without penalty, liability or obligation, or may at his election, deduct from any amount owed to the CONTRACTOR hereunder the amounts of such commission, percentage, brokerage or contingent fee.

#### **ARTICLE XIII - COMPLIANCE WITH APPLICABLE LAWS**

The CONTRACTOR shall comply with all applicable laws, ordinances, regulations and codes of the federal, state and local governments during the term of this Contract. However, if any applicable law, ordinance, regulation or code changes during this Contract that substantially alters the obligation of the CONTRACTOR, the CONTRACTOR shall be compensated for additional obligations. The CONTRACTOR shall likewise save the OWNER harmless with respect to any damages arising from any violation of the same by it.

## **ARTICLE XIV - NOTICES**

All formal notices, consents, approvals, requests and other communications (herein called "notices") required to be in writing under this Contract shall be mailed by registered or certified first-class mail, postage pre-paid, and addressed as follows:

If to the OWNER:

Patrick Ryan  
Director of Public Works  
City of Southfield Public Works  
25501 Clara Lane  
Southfield, Michigan 48034

If to the CONTRACTOR:

All other communications in writing may be mailed first-class mail, postage pre-paid to the above address.

All notices shall be deemed given on the day of the mailing. Either party to this Contract may change its address for the receipt of the notices at any time by giving notice thereof to the other as herein provided. Any notice by a party hereunder must be signed by an authorized representative of such party.

## **ARTICLE XV - FAIR EMPLOYMENT PRACTICES**

In accordance with the United States Constitution and all federal legislation and regulations governing fair employment practices and equal employment opportunity, including but not limited to Title VI of the Civil Rights Act of 1964 (P.L. 88-352, 78 STAT. 252), and United States Department of Justice Regulations (28 C.F.R. Part 42) issued pursuant to the Title, and in accordance with the Michigan Constitution and all state laws and regulations governing fair employment opportunity, including but not limited to the Michigan Civil Rights Act (P.A. 1976 No. 453) and the Michigan Handicappers Civil Rights Act (P.A. 1976 No. 220) the CONTRACTOR agrees that he will not discriminate against any person, employee, consultant or applicant for employment with respect to his(her) hire, tenure, terms, conditions or privileges of employment or hire because of his(her) religion, race, color, national origin, age, sex, height, weight, marital status, or handicap that is unrelated to the individual's ability to perform the duties of a particular job or position. The CONTRACTOR recognizes the right to the United States and the State of Michigan to seek judicial enforcement of the foregoing covenants against discrimination against itself or its SUBCONTRACTORS.

## **ARTICLE XVI - TERMINATION**

The OWNER may terminate this Contract for cause on twenty-four (24) hour notice. Any breach of the covenants and terms contained in this Contract may constitute grounds for termination for cause as determined by the OWNER. The CONTRACTOR shall remain liable to the OWNER for any damages sustained by the OWNER by virtue of the CONTRACTOR's breach or any reasonable costs the OWNER incurs enforcing or attempting to enforce this Contract. The OWNER may withhold any payment(s) to the CONTRACTOR for purposes of set-off until such

time as the exact amount of damages due the OWNER from the CONTRACTOR has been determined by law or equity. It is expressly understood that the CONTRACTOR will remain liable for any damages the OWNER may sustain in excess of any set-off. Should the OWNER or his designee undertake any part of the services which are to be performed by the CONTRACTOR, the CONTRACTOR shall not be entitled to any compensation for the services so performed.

The City may terminate this Contract without cause for any reason at any time by giving written notice to the CONTRACTOR of such termination specifying the effective date thereof, at least fifteen (15) days prior to the effective date of such termination. If the Contract is so terminated, the City will pay the CONTRACTOR only for the services rendered prior to termination, which payment shall constitute full and complete payment and satisfaction under the Contract.

## **ARTICLE XVII - MISCELLANEOUS**

No failure by the OWNER to insist upon strict performance of any covenant, agreement, term or condition of this Contract or to exercise any right, term or remedy consequent upon a breach thereof shall constitute a waiver of any such breach or of such covenant, agreement, term or condition. No waiver of any breach shall affect or alter this Contract, but each and every covenant, agreement, term and condition of this Contract shall continue in full force and effect with respect to any other existing or subsequent breach thereof.

If any provision of this Contract or application thereof to any person or circumstance shall, to any extent, become invalid or unenforceable, the remainder of the Contract, or the application of such provisions to persons or circumstances other than those as to which it is invalid or unenforceable shall not be affected thereby, and each provision of this Contract shall be valid and enforceable to the fullest extent permitted by law.

The headings and sections of this Contract are for convenience only and shall not be used to construe or interpret the scope of intent of this Contract or in any way affect the same.

The rights and remedies set forth herein are not exclusive and are in addition to any of the rights and remedies provided by law or equity. The Contract shall be governed by, and be subject to, and construed according to the laws of the State of Michigan.

This Agreement may be executed in any number of counterparts. All such counterparts shall be deemed to be originals and together shall constitute one and the same instrument.

This Agreement shall bind and the rights, benefits and advantages shall insure to the successors of the City of Southfield.

This Contract shall not become effective until approved by the OWNER and executed by the authorized officials thereof.

IN WITNESS WHEREOF the OWNER and the CONTRACTOR, by and through their duly authorized representatives, have executed this Agreement as of the year and date first written above.

WITNESS:  
CORPORATION)

OWNER: CITY OF SOUTHFIELD  
(A MICHIGAN MUNICIPAL

\_\_\_\_\_

By: \_\_\_\_\_  
**Kenson J. Siver, Mayor**

\_\_\_\_\_

By: \_\_\_\_\_  
**Allyson Bettis, City Clerk**

CONTRACTOR:

\_\_\_\_\_

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



**ACKNOWLEDGEMENT OF AUTHORITY**

**NOTE:** An officer of the firm *other* than the officer signing the contract on page A-10 must complete, date and sign this form. The purpose of this form is to verify that the person signing on page A-10 has the legal authority to enter your firm into a contract with the City of Southfield. Full and proper completion of this form is required by the City's Legal Department in order for your contract to be approved.

I, \_\_\_\_\_ as \_\_\_\_\_ of  
(Type or Print Your Name) (Your Office or Position)

\_\_\_\_\_ do hereby certify that \_\_\_\_\_  
(Name of Firm) (Name of Person Signing Contract)

is \_\_\_\_\_ of \_\_\_\_\_ and that he  
(Office or Position) (Name of Firm)

is authorized to execute, guarantee and commit \_\_\_\_\_ to the  
(Name of Firm)

conditions, obligations and undertakings contained in this Contract or Agreement.

IN WITNESS THEREOF, I have set my hand this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

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

**INSTRUCTIONS FOR EXECUTING AGREEMENT**

If the CONTRACTOR be a corporation, the following certificate should be executed.

I, \_\_\_\_\_, certify that I am the  
\_\_\_\_\_ Secretary of the  
Corporation named as CONTRACTOR

hereinabove; \_\_\_\_\_, who signed  
the foregoing Agreement on behalf of the CONTRACTOR, was then

\_\_\_\_\_ of said Corporation; that said  
Agreement was duly signed for and in behalf of said Corporation by authority of its governing  
body, and is within the scope of its corporate powers.

\_\_\_\_\_  
(Corporate Seal)

If the Agreement be signed by the secretary of the corporation, the above certificate should be executed by some other officer of the corporation, under the corporate seal. In lieu of the foregoing certificate there may be attached to the Agreement copies of so much of the records of the corporation as will show the official character and authority of the officers signing, duly certified by the secretary or assistant secretary under the corporate seal, to be true copies.

The full name and business address of the CONTRACTOR should be inserted and the Agreement should be signed with his official signature. Please have the name of the signing party or parties typewritten or printed in black ink under all signatures to the Agreement.

If the CONTRACTOR should be operating as a partnership, each partner should sign the Agreement. If the Agreement be not signed by each partner there should be attached to the Agreement a duly authenticated power of attorney evidencing the signer's (signers') authority to sign such Agreement for and in behalf of the partnership.

If the CONTRACTOR be an individual, the trade name (if the CONTRACTOR be operating under a trade name) should be indicated in the Agreement and the Agreement should be signed by such individual. If signed by one other than the CONTRACTOR there should be attached to the Agreement a duly authenticated power of attorney evidencing the signer's authority to execute such Agreement for and in behalf of the CONTRACTOR.

## **ORDER OF PREFERENCE**

The specifications in this book shall be taken in the following order of preference. The number one specification supersedes all specifications below it if there is a conflict between the specifications.

1. Supplemental Project Notes
2. Technical Specifications (Division 01 through Division 32)
3. Construction Drawings
4. General Conditions (GC/1 to GC/15) and Supplementary Conditions (GSC/1 to GSC/14)

This order shall hold throughout these specifications and shall be considered as part of the Contract Documents.

**GENERAL CONDITIONS**  
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## 1. CONTRACT DOCUMENTS

The original and three counterparts of the Contract shall be signed by the Owner and the Contractor, unless otherwise required.

The work under this Contract shall consist of the items listed in the Proposal, including all incidentals necessary to fully complete the project in accordance with the Contract Documents. The Contract Documents shall consist of the Advertisement, Instructions to Bidders, Proposal, Specifications, General Conditions, General Supplementary Conditions, Contract, Bonds and Contract Drawings.

## 2. CONTRACT DRAWINGS AND SPECIFICATIONS

The work to be done is shown on the accompanying set of original drawings prepared or contracted by City of Southfield Engineering Department, Southfield, Michigan, and are hereby made a part of this Contract, it being mutually understood and agreed that when taken together, the drawings and contract documents, including the specifications and the general conditions, are complimentary, and what is called for by any one shall be binding as if called for by all. The intent of the Contract Documents is to include in the contract price the cost of all labor and materials, water, fuel, tools, plant, equipment, light, transportation, and all other expenses as may be necessary for the proper execution and completion of the work.

These original drawings may be supplemented by other drawings furnished by the Contractor and approved by the Owner or supplied to the Contractor by the Owner during the progress of the work as he may deem to be necessary or expedient. All such supplementary contract drawings or instructions are intended to be consistent with the Contract Documents, true developments thereof and reasonably inferable therefrom. Therefore, no extra charge will be allowed on a claim that particular supplemental contract drawings or

instructions differed from the Contract Documents, incurring extra work, unless the Contractor has first brought the matter, in writing, to the Owner or Owner's Representative's attention for proper adjustment before starting on the work covered by such and has received from the Design Professional an order in writing to so proceed.

These original and supplementary drawings constitute the drawings according to which the work is to be done. The Contractor shall keep at the site of the work an approved or conformed copy of all drawings and specifications and shall at all times give the Design Professional or Owner access thereto.

In case any inconsistency, omission or conflict shall be discovered in either specifications or drawings, or if in any place, the meaning of either or both shall be obscure, or uncertain, or in dispute, the Design Professional shall decide as to the true intent and his decision shall be final and binding.

### **3. OWNER'S STATUS**

The Owner retains all rights to enforce all provisions of the Contract Documents, if administering the contract solely or if the Owner elects to retain an Owner's Representative, to work through the Owner's Representative to enforce all provisions of the Contract Documents.

### **4. OWNER'S REPRESENTATIVE'S STATUS**

The Owner's Representative and his Field Representative have authority to stop the work whenever such stoppage may be necessary to insure that the finished work will be in accordance with the Contract Document. They shall also have authority to reject all work and material which does not conform to the drawings and specifications.

### **5. OWNER'S FIELD REPRESENTATIVE'S STATUS**

The Owner may appoint on the job a Field Representative or use a City employee who shall be under the direction of the Owner's Representative. The Field Representative on the work will inform the Owner's Representative as to the progress of the work, the manner in which it is being done, and the quality of the materials being used. The Field Representative will call to the attention of the Contractor any failure to follow the drawings and specifications that he may observe. The Field Representative shall have the authority to reject materials or suspend the work until any questions on the performance of the work can be referred to and decided by the Owner or Owner's Representative. The Field Representative shall have no authority to direct the Contractor's work or workmen, to supervise the Contractor's operations or to change the contract drawings or specifications.

In no instance shall any action or omission on the part of the Field Representative release the Contractor of the responsibility of completing the work in accordance with the drawings and specifications.

### **6. CONTRACTOR'S RESPONSIBILITY**

The Contractor shall assume full responsibility for the work and take all precautions for preventing injuries to persons and property on or about the work; shall bear all losses resulting to him on account of the amount or character of the work or because the conditions under which the work is done are different, or because the nature of the ground in which the work is done is different from what was estimated or expected, or on account of the weather, floods, elements or other causes, and he shall assume the defense and save harmless the Owner and its individual officers and agents from all claims relating to labor provided and materials furnished for the work; to inventions, patents, and patent rights used in doing the work; to injuries to any persons or property received or sustained by or from the Contractor, his agents or employees

in doing the work or arising out of the work performed or to be performed; and to any act, or neglect of the Contractor, his agents or employees.

The mention of any specific duty or liability of the Contractor in this or in any part of the Contract Documents shall not be construed as a limitation or restriction upon any general liability or duty imposed on the Contractor by the Contract Documents.

## **7. PERMITS AND REGULATIONS**

The Contractor shall secure, at no cost to the Owner, all permits and licenses necessary for the prosecution of the work. The Contractor shall keep himself fully informed of all laws, ordinances, and regulations in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over the same.

He shall at all times observe and comply with, and shall cause all his agents and employees to observe and comply with all existing and future laws, ordinances, regulations, orders, and decrees. Provided that if the drawings and specifications are at variance therewith, the Contractor shall promptly notify the Design Professional in writing and any necessary changes shall be adjusted as provided in the Contract Documents.

## **8. SUBCONTRACTS**

The Contractor shall not sublet, assign, or transfer this Contract or any portion thereof or any payments due him thereunder, without the written consent of the Owner.

Assignment or subletting the whole or any portion of this Contract shall not operate to release the contractor or his bondsmen hereunder free from any of the contract obligations.

The Contractor shall, as soon as practicable after the signing of the Contract, notify the Owner in writing of the names of subcontractors proposed for the work and shall not employ any that the Owner may object to as incompetent or unfit.

If the Contractor shall cause any part of the work under this Contract to be performed by a subcontractor, the provisions of this Contract shall apply to such subcontractor and his officers and employees in all respects as if he and they were employees of the Contractor, and the Contractor shall not be in any manner thereby relieved from his obligation and liabilities; and the work and materials furnished by the subcontractor shall be subject to the same provisions as if furnished by the Contractor.

## **9. INFORMATION BY THE CONTRACTOR**

The Contractor shall submit to the Design Professional full information as to the materials, equipment, and arrangements which the Contractor proposes to furnish. This information shall be complete to the extent that the Design Professional may intelligently judge if the proposed materials, equipment, and arrangements will meet the contract requirements.

Prior to the approval of materials, equipment, and arrangements by the Design Professional based on the information submitted by the Contractor, any work done by the Contractor shall be at his own risk.

The approval of information covering materials, equipment, and arrangements by the Design Professional shall in no way release the Contractor from his responsibility for the proper design, installation and performance of any material, equipment, or arrangement, or from his liability to replace same should it prove defective.

## **10. GENERAL REQUIREMENTS FOR MATERIALS & WORKMANSHIP**

In the specifications where a particular material or piece of equipment is specified by

reference to some particular make or type, or equal, it is not the intent to limit competition but to set up by such reference a standard of quality most easily understood and defined. If materials or equipment of other make or type than that specified by name are offered by the Contractor, they will be given full consideration by the Design Professional and the Design Professional's decision will be final as to whether the materials or equipment offered are equal to those specified.

Unless otherwise stipulated in the specifications, all equipment, materials, and articles incorporated in the work covered by this Contract are to be new and of the best grade of their respective kinds for the purpose. The Contractor shall, if required, furnish such evidence as to kinds and quality of materials as the Design Professional may require.

The Contractor shall furnish suitable tools and building appliances and employ competent labor to perform the work to be done, and any labor or tools or appliances that shall not, in the judgment of the Design Professional, be suitable or competent to produce this result may be ordered from the work by him and such labor or tools or appliances shall be substituted therefor by the Contractor as will meet with the approval of the Design Professional.

If not otherwise provided, material or work called for in this contract shall be furnished and performed in accordance with well known established practice and standards recognized by architects, engineers and the trade.

## **11. TESTING AND SAMPLING**

Where called for in the specifications, samples of materials in the quantity named shall be submitted to the Design Professional for approval. Where tests are required they shall be made at the expense of the Contractor, except as otherwise called for in the specifications. For materials covered by

ASTM or Federal Specifications, unless otherwise stipulated, the required tests are to be made by the manufacturer and his certificate therefor submitted to the Design Professional.

## **12. LINES AND GRADES**

Principal reference lines or points and benchmarks shall be given by the Design Professional at such time as he may deem necessary; or if the Contractor shall be in need of such reference lines or benchmarks, he shall notify the Design Professional forty-eight (48) hours in advance, excluding Saturdays, Sundays and holidays.

The Design Professional will set suitable stakes and marks showing the locations and elevations of the various parts of the work and will furnish the Contractor with "cut sheets" referred to the reference points. No work shall be undertaken until such stakes and marks shall have been set by the Design Professional. The Contractor shall take due and proper precautions for the preservation of these stakes and marks, and shall see to it that the work at all times proceeds in accordance therewith and shall provide all labor and material to set required batter boards and locate the work accurately with reference to the above points.

For tunnel work, the Contractor shall accurately locate the work from the reference points established by the Design Professional and shall be responsible for the proper setting of the model, both as to line and grade. He shall use such methods and means as are necessary to properly do this work. The Design Professional will carry line and grade down to the bottom of each shaft. The Contractor will start and carry on the work from the points thus established. As the work progresses and the tunnel masonry is completed, the Design Professional will carry forward along the completed work, reference points both as to line and grade, from which points the Contractor shall set the models and carry forward the work. It is the intent that such points will be maintained up to

distances not greater than 120 feet behind the open heading. The Contractor shall furnish and set proper wood blocks where requested so as to facilitate the establishing of the reference points.

### **13. PROTECTION OF WORK AND PROPERTY**

The Contractor shall continuously maintain adequate protection of all his work from damage and shall protect all public property and private abutting property from injury or loss arising in connection with this Contract. He shall, without delay, make good any such damage, injury or loss, and shall defend and save the Owner harmless from all such damages or injuries occurring because of his work. He shall furnish and maintain all passageways, barricades, guard fences, lights and danger signals, provide watchmen and other facilities for protection required by public authority or by local conditions, all at no additional cost to the Owner.

In an emergency affecting the safety of life or of the work or of adjoining property, the Contractor, without special instruction or authorization from the Owner, shall take such action as may be necessary to prevent such threatened damage, injury or loss.

The Contractor shall assume full responsibility of loss or damage to the work during the entire construction period resulting from caving earth and from storms, floods, frosts, and other adverse weather conditions, and from all other causes whatsoever, not directly due to the acts or neglect of the Owner, including fire, vandalism and malicious mischief, and shall turn the finished work over to the Owner in good condition and repair, at the time of the final estimate.

### **14. RESPONSIBILITY FOR ADJOINING STRUCTURES & TREES**

The Contractor shall assume full responsibilities for the protection of all pavements, curbs, bridges, railroads, poles

and any other surface structures and all water mains, sewers, telephone, gas mains, and other underground services and structures along and near the work which may be affected by his operations, and shall indemnify, defend and save harmless the Owner against all damages or alleged damages to any such structure arising out of his work. The Contractor shall bear the cost of repair or replacement of any such structure damaged as a result of his operations.

No trees or shrubbery of any kind shall be removed or destroyed by the Contractor without the written permission of the Owner, and the Contractor will be held fully responsible for any damages caused by his work to adjoining trees and shrubs. Ample precautions shall be taken by the Contractor to protect such trees and shrubs as are to remain in place by surrounding them with fences or other protection before construction work begins. Shrubby that has to be removed shall be preserved and replaced in a manner acceptable to the Owner.

### **15. MAINTENANCE OF SERVICE**

Drainage through existing sewers and drains shall be maintained at all times during construction and all nearby gutters shall be kept open for drainage. Where existing sewers are encountered in the line of the work which interfere with the construction, the flow in the sewers, including both dry weather flow and storm flow, shall be maintained.

All detours shown on the drawings or required because of the Contractor's operations shall be built and maintained at the Contractor's expense.

Safety precautions shall be followed at all street openings, substantial barricades shall be erected as deemed necessary to prevent accidents to vehicular or pedestrian traffic and red flags by day and red lights by night shall be diligently posted by the Contractor at



all points of possible danger. In case detours or other traffic instructions are necessary, suitable warning or direction signs shall be erected and maintained by the Contractor.

During the progress of the work, the Contractor shall accommodate both vehicular and foot traffic and shall provide free access to fire hydrants, water and gas valves. Except as otherwise specified herein or as noted on the drawings, street intersections may be blocked but one-half at a time, and the Contractor shall lay and maintain temporary driveways, bridges and crossings, such as in the opinion of the Owner are necessary to reasonably accommodate the public.

In the event of the Contractor's failure to comply with these provisions, the Owner may with or without notice, cause the same to be done; and will deduct the cost of such work from any money due or to become due the Contractor under this Contract, but the performance of such work by the Owner or at his instance, shall serve in no way to release the Contractor from his general or particular liability for the safety of the public or the work.

#### **16. STORAGE OF MATERIALS**

Materials and equipment distributed, stored and placed upon or near the site of the work shall at all times be so disposed as not to interfere with work being prosecuted by other contractors in the employ of the Owner, or with street drainage, or with fire hydrants or with access thereto, and not to hinder, any more than may be necessary, the ordinary traffic of the street.

#### **17. RELATION TO OTHER CONTRACTORS**

The Contractor shall so conduct his operations as not to interfere with or injure the work of other contractors or workmen employed on adjoining or related work and he shall promptly make good any injury or damage which may be done to such work by him or his employees or his agent. Should a contract for adjoining work be awarded to

another contractor, and should the work of one of these contracts interfere with that of the other, the Owner shall decide which contractor shall cease work for the time being and which shall continue or whether the work in both contracts shall continue at the same time and in what manner.

#### **18. CONTRACTOR'S SUPERVISION AND ORIGINATION**

The work under this Contract shall be under the direct charge and direction of the Contractor. The Contractor shall give efficient superintendence to the work, using his best skill and attention. The Contractor shall at all times keep on the site of the work, during its progress, a competent superintendent and any and all necessary foremen and assistants. The superintendent shall represent and have full authority to act for the Contractor in the latter's absence, and all directions given to him shall be as binding as if given to the Contractor. On written request in each case, all such directions will be confirmed in writing to the Contractor.

The Contractor shall employ only competent, efficient workmen and shall not use on the work any unfit person or one not skilled in the work assigned to him, and he shall at all times enforce strict discipline and good order among his employees. Whenever the Owner shall notify the Contractor, in writing, that any man on the work is, in the opinion of the Owner, careless, incompetent, disorderly, or otherwise unsatisfactory, such man shall be discharged from work and shall not again be employed on it except with the written consent of the Owner.

The Contractor shall establish and maintain an office on the site of the work or at some convenient point adjacent thereto, during the continuance of this Contract and shall have at all times during working hours, a representative authorized to receive and execute any and all orders, when given by the Design Professional; and such order, when given out and received by said

representative shall be deemed to have been given to and received by the Contractor. Copies of the drawings and specifications shall at all times be kept on file by the Contractor at readily accessible points near the work.

## **19. FACILITIES FOR INSPECTION**

The Owner, the Design Professional, and their employees shall at all times have the right to enter upon the premises upon which work is being done, or upon which material is stored for the work under this Contract, and to inspect the work and materials, and to ascertain whether or not the construction is carried out in accordance with this Contract, and the Contractor shall furnish all reasonable facilities, and given ample time for such inspection. All materials shall be subject to mill and shop inspection, as provided in the specifications.

The Contractor shall promptly remove from the premises all materials rejected by the Design Professional as failing to meet contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the Contract 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.

If the Contractor does not remove such rejected work and materials promptly, after written notice, the Owner may remove them and store the material at the expense of the Contractor.

The Design Professional has the right to have removed by the Contractor such portion of the work as he may deem necessary for the discovery of improper work or material, and the Contractor must restore such work at his own expense if improperly done and at the expense of the party of the first part if found to be in proper condition. Any work which, during its progress and before its final acceptance, may become damaged from

any cause, shall be removed and replaced by good, satisfactory work at the Contractor's expense.

## **20. SHOP DRAWINGS**

Where called for in the specifications, the Contractor shall submit to the Design Professional for approval, not less than five copies of details, specifications, cuts, and drawings of such equipment and structural work as may be required. The Contractor shall make any changes or alterations required by the Design Professional and re-submit same without delay. The approval of the Design Professional shall not relieve the Contractor of responsibility for errors in the drawings, as the Design Professional's checking is intended to cover compliance with the drawings and specifications and not to enter into every detail of the shop work. No work shall be undertaken until the Design Professional has approved the shop drawings.

## **21. ERRORS AND CORRECTIONS IN DRAWINGS AND SPECIFICATIONS**

The Contractor shall examine and check all drawings and specifications furnished by the Owner for dimensions, quantities, and coordination with other parts of the work on this or related contracts and shall notify, in writing, the Design Professional of any and all errors, omissions, or discrepancies he may discover by examining and checking of same. The Contractor shall not be allowed to take advantage of any such error, omission, or discrepancy, as full instructions will be furnished by the Design Professional, and the Contractor shall carry out such instructions as if originally specified. In no case shall the Contractor proceed with the work in uncertainty, and any work done by the Contractor after the discovery of any error, omission, or discrepancy, until authorized, will be at the Contractor's risk and responsibility. The work is to be made complete and to the satisfaction of the Design Professional, notwithstanding any minor omissions in the specifications or drawings.

## 22. CHANGES IN THE WORK

The Owner shall have the right to require, by written order, changes in, additions to, or deductions from the work required by the contract documents; provided that if changes, additions, or deductions are made, the general character of the work as a whole is not changed thereby. Adjustments in the contract price, if any, because of any change, addition, or deduction in the work shall be determined as hereinafter provided, and any claim for extension of time for completion shall be adjusted at the time of ordering the change, addition, or deduction. No claim for change, addition, or deduction, or adjustment of price, or extension of time for completion thereof, shall be made or allowed unless done in pursuance of a written order from the Owner specifically authorizing such change, addition, or deduction. Drawings without a written order shall not be considered such authority. Written notice of such claims shall be made to the Design Professional before the commencement of work. Where the written order diminished the quantity of work to be done, this shall not constitute a basis for a claim for damages or anticipated profits on the work that may be deleted.

Under circumstances which, in the judgment of the Design Professional, so necessitate, the Design Professional shall have authority to require, by written order, changes in, additions to, or deductions from the work. Such written order by the Design Professional shall be subject to later confirmation by the Owner when the extent and costs have been established.

It is understood and agreed that in case any change in, addition to, or deduction from the work is required, said change shall in no way invalidate the Contract and shall not affect or discharge the bonds furnished by the Contractor.

The Contractor, without extra charge, shall make such slight alterations as may be

necessary to make adjustable parts fit to fixed parts, leaving all complete and in proper shape when done.

## 23. BASIS FOR DETERMINING COST OF CHANGES IN THE WORK

Adjustments, if any, in the contract price by reason of change in the work shall be limited to the amount specified in the written order authorizing the change in the work.

Adjustments shall be determined by one or more of the following methods, the Owner reserving the right to select the method or methods at the time the written order is issued:

- a) An acceptable lump sum proposal: To facilitate checking and acceptance, the proposal shall be itemized with quantities and prices given for the various items.
- b) Unit Prices: The unit prices may be the "Unit Price" set in the Agreement, or fixed by subsequent agreement between the Owner and the Contractor.
- c) On a cost-plus-limited basis not to exceed a specified maximum limit of cost:

"COST" as herein used shall be the actual and necessary costs incurred by the Contractor by reasons of the change in the work for:

- 1) Labor
- 2) Materials
- 3) Equipment Rental
- 4) Insurance Premiums

- 1) Labor Costs shall be the amount shown on the Contractor's payroll with payroll taxes added when such taxes can be shown to have been incurred. In no case shall the rates charged for labor exceed the rates paid by the Contractor for the same class of labor employed by him to perform work under the regular items of the Contract.

- 2) Material Costs shall be the net price paid for material delivered to the site of the work. If any material previously required is omitted by the written order of the Owner after it has been delivered to or partially worked on by the Contractor and consequently will not retain its full value for other uses, the Contractor shall be allowed the actual cost of the omitted material less a fair market value of the material as determined by the Owner.
- 3) Equipment Rental shall be the actual additional costs incurred for necessary equipment. Costs shall not be allowed in excess of usual rental charged in the area for similar equipment of like size and condition, including the costs of necessary supplies and repairs for operating the equipment. No costs, however, shall be allowed for the use of equipment on the site in connection with other work unless its use incurs actual and additional costs to the Contractor. If equipment not on the site is required for the change in the work only, the cost of transporting such equipment to and from the site shall be allowed.
- 4) Insurance Premiums shall be limited to those based on labor payroll and to the types of insurance required by the Contract. The amount allowed shall be limited to the net costs incurred as determined from the labor payroll covering the work. The Contractor shall, upon request of the Owner, submit verification of the applicable insurance rates and premium computations.

“PLUS” as herein used is defined as a percentage to be added to the items of “Cost” to cover superintendence, use of ordinary tools, bonds, overhead expense and profit. The percentage shall not exceed 15 percent on work done entirely by the Contractor and shall not exceed an aggregate total of 20 percent on work

done by a subcontractor.

“SPECIFIED MAXIMUM LIMIT OF COST” is the amount stated in the written order of the Owner authorizing the change in the work. The amount to be allowed the Contractor shall be the “cost” and “plus” the percentage or the specified maximum, whichever is the lesser amount.

The Contractor shall keep complete, accurate, daily record of the net actual cost of changes in the work, and shall present such information in such form and at such times as the Owner may request.

## 24. PATENTS

The Contractor shall pay all royalties and license fees and shall hold and save the Owner and his agent harmless from all liability of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the owner, unless otherwise specifically stipulated in the Contract Documents. In this respect the Contractor shall defend all suits or claims for infringement of any patent or license right.

In the event that any claim, suit, or action at law or in equity of any kind, whatsoever, is brought against the Owner, involving any such patents or license rights, then the Owner shall have the right to, and may, retain from any money due or to become due to the Contractor, such sufficient sum as is considered necessary to be retained by the Owner until such claim or suit shall have been settled and satisfactory evidence to that effect shall have been furnished the Owner.

## 25. “OR EQUAL” CLAUSE

Whenever in any of the Contract Documents an article, material, or equipment

is defined by describing a proprietary product, or by using the name of a manufacturer or vendor, the term "or equal" if not inserted, shall be implied. The specific article, material, or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency, and quality desired and shall not be construed in such a manner as to exclude manufacturer's products of comparable quality, design and efficiency. The Contractor shall comply with the requirements of the Contract Documents relative to the Owner's approval of materials and equipment before they are incorporated in the work.

## **26. CLEANING UP**

The Contractor shall remove at his own expense from the Owner's property and from all public and private property all temporary structures, rubbish and waste materials resulting from his operations. This requirement shall not apply to property used for permanent disposal of rubbish or waste materials in accordance with permission of such disposal granted to the Contractor by the Owner thereof.

## **27. USE OF COMPLETE PORTIONS OF THE WORK**

The Owner may, at any time during progress of the work, after written notice to the Contractor, take over and place in service any completed portions of the work which are ready for service, although the entire work of the Contract is not fully completed, and notwithstanding the time for completion of the entire work or such portions may not have expired. In such event, the Contractor will be relieved of further work on or maintenance of said portion, except as covered by his guarantee of same.

## **28. PAYMENT WITHHELD**

The Owner may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate for

progress payment to such extent as may be necessary to protect itself from loss on account of:

- a) Defective work not remedied.
- b) Claims filed or reasonable evidence indicating probable filing of claims.
- c) Failure of the Contractor to make payments properly to subcontractors or for material or labor.
- d) A reasonable doubt that the Contract can be completed for the balance then unpaid.
- e) Damage to another contractor.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

## **29. CONTRACTOR'S RIGHT TO STOP WORK**

If the work should be stopped under an order of any court, or other public authority for a period of three months, through no act or fault of the Contractor or of anyone employed by him, or if the Owner should fail to pay to the Contractor any sum certified by the Design Professional, provided no appeal is taken, the Contractor may, upon seven days written notice to the Owner and the Design Professional, stop work or terminate this Contract, and shall receive from the Owner payment in full for all work executed, as determined from the prices contained in the approved detailed estimate as computed by the Design Professional, but no claim for extra compensation or damages shall be made or allowed because of such termination of the Contract.

## **30. FAIR EMPLOYMENT PRACTICES ACT**

The Contractor agrees that neither he nor his subcontractor will discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to his hire, tenure, terms, conditions, or privileges of employment, or any matter directly or indirectly related to employment, because of his race, color, religion, national origin or ancestry. Breach of this covenant may be

regarded as a material breach of this Contract.

### **31. AUTHORITY**

No agent of the Owner shall have power to revoke, alter, enlarge, or relax the stipulation or requirements of these specifications, except insofar as such authority may be specifically conferred by the specifications themselves, without the formal authorization to do so, conferred by the Contract of which the specifications are a part, or by ordinance, resolution, or other usual official action by the Owner.

### **32. STARTING WORK**

Material shall be ordered and work shall begin on the ground within thirty (30) days after the Contract is signed, unless otherwise stated.

### **33. SANITARY REGULATIONS**

Necessary sanitary conveniences for the use of laborers on the work, properly secluded from public observation, shall be constructed and maintained in sanitary condition by the Contractor, and their use shall be strictly enforced.

### **34. SUNDAY AND NIGHT WORK**

The Contractor is required to prosecute work done under this Contract during the hours of daylight, and no work will be permitted at night or on Sundays, except to save property or life or as specifically authorized or directed by the Owner. Tunnel work may be prosecuted at night except on Sundays.

### **35. PROGRESS OF WORK**

The work shall be prosecuted regularly and uninterruptedly, unless the Owner shall otherwise specifically direct, with such force and at such points as to insure its full completion within the time herein stated.

If, in the opinion of the Owner, it is

necessary or advisable that certain portions of the work be done immediately, the Contractor, upon written order, shall proceed with such work without delay. Should he fail to so proceed, the Owner may do or cause to be done, such work, and the cost of the same will be deducted from any money due or to become due the Contractor under this Contract.

### **36. TIME OF COMPLETION**

The time allowed for completion of the work contemplated in this Contract shall be as stated in the proposal or specifications.

### **37. EXTENSION OF TIME**

All days in which work is suspended by order of the Design Professional, or in accordance with these specifications, shall automatically extend the time for completion an equal number of days.

### **38. TIME IS ESSENCE OF CONTRACT**

It is distinctly understood and agreed to by the parties hereto that the time specified for the completion of the work is the essence of this Contract, and the Contractor shall not be entitled to claim performance of this agreement unless the work is satisfactorily completed, in every respect, within the time herein specified.

### **39. ESTIMATED QUANTITIES**

The quantities of the various classes of work to be done and materials to be furnished under this Contract, which have been estimated as stated elsewhere herein, are approximate and only for the purpose of comparing, on a uniform basis, the bids offered for the work under this Contract; and neither the Owner nor his agents is to be held responsible should any of the said estimated quantities be found incorrect during the construction of the work; and the Contractor shall make no claim for anticipated profit, nor

for loss of profit, because of a difference between the quantities of the various classes of work actually done or materials actually delivered and the estimated quantities as herein stated.

#### **40. FORFEITURE OF CONTRACT**

If the work to be done under the Contract shall be abandoned by the Contractor, or if at any time in the judgment of the Owner, the Contractor shall fail to prosecute the work at a reasonable rate of progress, or to comply with all or any of the terms and requirements herein set forth, then the Owner shall have the right to take possession of the work, including Contractor's plant, supplies, and materials, at any time after having notified the Contractor in writing to discontinue the work under this Contract for said cause or causes, and such action shall not affect the right of the Owner to recover damages resulting from such failure. Upon receiving such notice, the Contractor shall and will, upon demand, immediately give the Owner safe and peaceable possession of the work, including the plant, and shall then cease to have control over any portion thereof or the men employed thereon.

The Owner may then proceed to complete the work herein specified, by contract or otherwise; and the entire cost of the same shall be charged to the Contractor and deducted from any sum or sums due or to become due under the Contract; the excess cost, if any, to be paid by the Contractor or his sureties, to said Owner.

#### **41. NO WAIVER OF CONTRACT**

Neither the acceptance of the whole or any part of the work by the Owner or his Design Professional, or any of its agents, nor any order, measurements, or certificate by the Design Professional, nor any order by the Owner for the payment of money, nor any payment for the whole or any part of the work by the Owner, nor any extension of time, nor any possession taken by the Owner or its agents, shall operate as a waiver for any

portion of the Contract or any power therein provided; nor shall any waiver of any breach of the Contract be held to be a waiver of any other or subsequent breach.

#### **42. PAYMENT NOT TO BE STOPPED**

The Owner shall not, nor shall any officer thereof, be precluded or estopped by any return or certificate made or given by the Design Professional, or other officer, agent or appointee, under the provisions of this agreement, at any time (either before or after the final completion and acceptance of the work and payment made therefor pursuant to any such return or certificates showing the true and correct amount of money due therefor, notwithstanding any such return or certificate, or any payment made in accordance therewith) from demanding and receiving from the Contractor or his sureties, separately or collectively, such sums as may have been improperly paid said Contractor by reason of any such return or certificate which has been untrue or incorrectly compiled.

#### **43. GUARANTEE**

The Contractor, as a condition precedent to final payment, shall execute a guarantee to the Owner warranting for a period of one year from the date of final payment to keep in good order and repair any defect in all the work done under the Contract, either by the Contractor or his subcontractors, or the material suppliers, that may develop during said period due to improper materials, defective equipment, workmanship, or arrangements, and any other work affected in making good such imperfections shall also be made good, all without expense to the Owner, and the Contractor shall execute, in favor of the Owner, the attached Maintenance and Guarantee Bond.

When the specifications call for a guarantee period greater than two years, the Contractor shall provide such longer guarantee period.

#### 44. ESTIMATES AND PAYMENTS

The Owner shall pay and the Contractor receive the prices bid in the proposal, or agreed upon, less any deduction for any uncompleted portion, based upon measurements made by the Design Professional or as otherwise herein stipulated, and such measurements shall be final and conclusive.

As an aid to the Owner in preparing estimates for progress payments, the Contractor may be required to submit to the Owner for approval a breakdown of some or all contract unit prices into their essential component parts. The sum of component parts shall not exceed the total contract price per unit and the breakdown shall not overrule the contract price per unit.

The Contractor shall submit to the Owner a written request for each payment and a Contractor's Declaration declaring that he has not performed any work, furnished any material, sustained any loss, damage or delay, for any reasons, including soil conditions encountered or created, or otherwise done anything for which he will ask, demand, sue for, or claim compensation from the Owner other than, as indicated on the Contractor's Declaration. When requested by the Owner, the Contractor shall submit receipts or other vouchers showing his payments for materials and labor, including payments to subcontractors.

Payments based on progress estimates will be made on a monthly basis for work completed during the preceding month or since the date of the last preceding progress payment. Payments will be in accordance with the provisions of Act 524 of the Michigan Public Acts of 1980 and in accordance with the terms of this Contract. No allowance will be made for materials furnished which are not incorporated in the finished work, unless otherwise stated.

Pursuant to Act 524, Michigan Public

Acts of 1980, the Owner shall designate a person representing it to whom written requests for payments shall be submitted. The Contractor shall designate a person who shall submit written requests for payment to the Owner.

In the event a dispute arises over an avoidable or unacceptable delay in the performance of the work as described in Section 4(3) of Act 524 of Michigan Public Acts of 1980 [MCLA125.1564(3)], the dispute may, at the option of the Owner, be submitted for resolution in accordance with the provisions of Section 4 of Act 524 of the Michigan Public Acts of 1980 to an agent designated pursuant to Section 4(2) of the Act. The dispute resolution process described above shall be used only for the purpose of determining the rights of the parties to retained funds and interest earned on retained funds.

The Owner may withhold the payment of any estimate or portion of estimate until the Contractor shall have furnished satisfactory evidence that he has paid all claims of every nature.

No payment shall be considered as acceptance of the work or any portion thereof prior to the final completion of the work, and the payment of the final estimate.

Within thirty (30) days after the completion of the work under this Contract to the satisfaction of the Owner and the Design Professional, in accordance with all and singular terms and stipulations herein contained, the Owner shall make final payment, from a final estimate made by the Design Professional. Before final payment is made, the Contractor shall, as directed by the Owner, furnish a Contractor's Affidavit that he has paid or satisfactorily secured all claims of every nature. Also, the Contractor shall furnish a release from the surety or sureties and permit agencies as applicable, approving payment of final estimate by the Owner. The final payment, when made, shall



be considered as final approval and acceptance of the completed work herein specified.

The acceptance by the Contractor of the final payment aforesaid shall operate as, and shall be, a release to the Owner and his

agents, from all claim and liability to the Contractor for anything done or furnished for, relating to the work, or for any act or neglect of the Owner or of any person relating to or affecting the work.

**CONTRACTOR'S DECLARATION**

I hereby declare that I have not, during the period \_\_\_\_\_

to \_\_\_\_\_ A.D., 20\_\_\_\_, performed any work, furnished any material, sustained any loss, damage or delay for any reason, including soil conditions encountered or created, or otherwise done anything for which I shall ask, demand, sue for, or claim compensation from \_\_\_\_\_ the Owner, or his agents, in addition to the regular items set forth in the contract numbered and dated \_\_\_\_\_ A.D., 20\_\_\_\_\_ for \_\_\_\_\_

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

executed between myself and the Owner, and in the Change Orders for work issued by the Owner in writing as provided thereunder, except as I hereby make claim for additional compensation and/or extension of time as set forth on the itemized statement attached hereto.

There (is) (is not) an itemized statement attached.

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

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

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

Position: \_\_\_\_\_

**CONTRACTOR'S AFFIDAVIT**

STATE OF MICHIGAN ..... )  
County of )<sup>ss</sup>

The undersigned \_\_\_\_\_  
hereby represents that on

he (it) was awarded a contract by \_\_\_\_\_

hereinafter called the Owner, to \_\_\_\_\_ ,

in accordance with the terms and conditions of Contract No. \_\_\_\_\_; and the undersigned

further represents that the subject work has now been accomplished and the said contract has  
now been completed.

The undersigned hereby warrants and certifies that all of his (its) indebtedness arising by reason  
of the said contract has been fully paid or satisfactorily secured; and that all claims from  
subcontractors and others for labor and material used in accomplishing the said project, as well  
as all other claims arising from the performance of the said contract, have been fully paid or  
satisfactorily settled. The undersigned further agrees that if any such claim should hereafter arise,  
he (it) shall assume responsibility for the same immediately upon request to do so by the Owner.

The undersigned, for a valuable consideration, the receipt of which is hereby acknowledged, does  
further hereby waive, release and relinquish any and all claims or right of lien which the  
undersigned now has or may hereafter acquire upon the subject premises for labor and material  
used in accomplishing said project owned by the Owner.

This affidavit is freely and voluntarily given with full knowledge of the facts, on this \_\_\_\_\_ day  
of \_\_\_\_\_, 20\_\_\_\_\_.

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

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

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

Subscribed and sworn to before me, a Notary Public in and for \_\_\_\_\_ County,

Michigan, on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_ Notary Public

My Commission Expires \_\_\_\_\_

**GENERAL SUPPLEMENTARY CONDITIONS - INSURANCE AND BONDS**

**INSURANCE**

**Insurance Required of the Contractor**

Prior to commencement of the work, the Contractor shall purchase and maintain during the term of the project such insurance as will protect him, the Owner, and the Design Professional from claims arising out of the work described in this contract and performed by the Contractor, Subcontractor(s) or Sub-Subcontractor(s) consisting of:

Workers' Compensation insurance including Employer's Liability to cover employee injuries or disease compensable under the Workers' Compensation Statutes of the states in which work is conducted under this contract; disability benefit laws, if any; or Federal compensation acts such as U.S. Longshoremen or Harbor Workers', Maritime Employment, or Railroad Compensation Act(s), if applicable. Self-insurance plans approved by the regulatory authorities in the state in which work on this project is performed are acceptable.

A Comprehensive General Liability policy to cover bodily injury to persons other than employees and for damage to tangible property, including loss of use thereof, including the following exposures:

- a. All premises and operations.
- b. Explosion, collapse and underground damage.
- c. Contractor's Protective coverage for independent contractors or subcontractors employed by him.
- d. Contractual Liability for the obligation assumed in the Indemnification or Hold Harmless agreement found hereinafter.
- e. The usual Personal Injury Liability endorsement with no exclusions pertaining to employment.

- f. Products and Completed Operations coverage. This coverage shall extend through the contract guarantee period.

A Comprehensive Automobile Liability policy to cover bodily injury and property damage arising out of the ownership, maintenance or use of any motor vehicle, including owned, non-owned and hired vehicles and including Michigan "No Fault" coverages. In light of standard policy provisions concerning (a.) loading and unloading and (b.) definitions pertaining to motor vehicles licensed for road use vs unlicensed or self-propelled construction equipment, it is strongly recommended that the Comprehensive General Liability and the Comprehensive Auto Liability be written by the same insurance carrier, though not necessarily in one policy.

Where such an exposure exists, the Contractor shall purchase for the Owner an Owner's Protective Liability policy to protect the Owner, the Design Professional, their consultants, agents, employees and such public corporations in whose jurisdiction the work is located for their contingent liability for work performed by the Contractor, the Subcontractor(s) or the Sub-Subcontractor(s) under this contract.

The Contractor shall purchase a Builder's Risk-Installation Floater in a form acceptable to the Owner covering property of the project for the full cost of replacement as of the time of any loss which shall include, as named insureds, (a.) the Contractor, (b.) all Subcontractors, (c.) all Sub-Subcontractors, (d.) the Owner, and the Design Professional, as their respective interests may prove to be at the time of loss, covering insurable property which is the subject of this contract, whether in place, stored at the job site, stored elsewhere, or in transit at the risk of the insured(s). Coverage shall be effected on an

"All Risk" form including, but not limited to, the perils of fire, wind, vandalism, collapse, theft and earthquake, with exclusions normal to the cover. The Contractor may arrange for such deductibles as he deems to be within his ability to self-assume, but he will be held solely responsible for the amount of such deductible and for any coinsurance penalties. Any insured loss shall be adjusted with the Owner and the Contractor and paid to the Owner and Contractor as trustee for the other insureds.

### **Umbrella or Excess Liability**

The Contractor is granted the option of arranging coverage under a single policy for the full limit required or by a combination of underlying policies with the balance provided by an Excess or Umbrella Liability policy equal to the total limit(s) requested. Umbrella or Excess policy wording shall be at least as broad as the primary or underlying policy(ies) and shall apply both to the Contractor's general liability and to his automobile liability insurance.

### **Railroad Protective Liability**

Where such an exposure exists, the Contractor will provide coverage in the name of each railroad company having jurisdiction over rights-of-way across which work under the contract is to be performed. See Additional Named Assured.

### **Limits of Liability**

The required limits of liability for insurance coverages shall be not less than the following:

#### Workers Compensation

Coverage A - Compensation Statutory

Coverage B - Employers Liability

\$ 100,000

#### Comprehensive General Liability

Bodily Injury - Each Occurrence

\$ 500,000

Bodily Injury - Aggregate  
(Completed Operations)

\$ 500,000

Property Damage - Each Occurrence

\$ 100,000

Property Damage - Aggregate

\$ 500,000 or combined single limit

\$ 1,000,000

#### Comprehensive Automobile Liability

Bodily Injury

\$ 500,000

Property Damage

\$ 200,000

or combined single limit

\$ 1,000,000

Owner's Protective - See GCS/3

Umbrella or Excess Liability See GCS/3

### **Insurance - Other Requirements**

Notice of Cancellation or Intent Not to Renew - Policies will be endorsed to provide that at least 30 days written notice shall be given to the Owner and to the Design Professional of cancellation or of intent not to renew. See Additional Named Assured.

### **Evidence of Coverage**

Prior to commencement of the work, the Contractor shall furnish to the Owner, Certificates of Insurance in force on the Owner's Form of Certificate provided. Other forms of Certificate are acceptable only if (1) they include all of the items prescribed in the Owner's Form of Certificate, including agreement to cancellation provisions outlined herein, and (2) they have written approval of the Owner and the Design Professional. The Owner reserves the right to request complete copies of policies if deemed necessary to ascertain details of coverage not provided by certificates. Such policy copies shall be "Originally Signed Copies," and so designated.

A. Insurance Required for the Contractor.

1. Worker's Compensation and Employers' Liability Comprehensive General Liability - including:
  - a. All premises and operations.
  - b. Explosion, collapse and underground damage.
  - c. Contractors' Protective
  - d. Contractual Liability for obligations assumed in the Indemnification - Hold Harmless agreement of this contract.
  - e. Personal Injury Liability
  - f. Products and Completed Operations
2. Comprehensive Automobile Liability - including owned, non-owned and hired vehicles, and Michigan "No Fault" coverages.
3. Umbrella or Excess Liability

#### B. Insurance Required for the Owner

Owners' Protective Liability which names as insured(s) the Owner, the Design Professional, their consultants, agents, employees and such public corporations in whose jurisdiction the work is located. (See Additional Named Assured hereinafter).

#### Qualification of Insurers

In order to determine financial strength and reputation of insurance carriers, all companies providing the coverages required shall be licensed or approved by the Insurance Bureau of the State of Michigan and shall have a financial rating no lower than XI and a policyholder's service rating no lower than B+ as listed in A.M. Best's Key Rating Guide, current edition. Companies with ratings lower than B+; XI will be acceptable only upon written consent of the Owner.

## **BONDS**

### Contract Security

If the Owner is a public entity, the Contractor shall furnish a surety bond (form attached) in an amount at least equal to 100 percent of the contract price as security for the faithful performance of this contract. The Contractor shall furnish, also, a separate surety bond (form attached) in an amount at least equal to 100 percent of the contract price as security for the payment of all persons performing labor on the project under this contract, and furnishing materials in connection with this contract. The surety on each such bond shall be a duly authorized surety company satisfactory to the Owner.

Regardless of whether the Owner is or is not a public entity, the Contractor shall furnish a Maintenance and Guarantee Bond (form attached) covering all work under this contract. The guarantee is to cover a period of two (2) years subsequent to the date of the final estimate, unless otherwise specified.

### Indemnification

The contractor agrees to indemnify, defend, and save harmless the Owner and the Design Professional, their consultants, agents, and employees, from and against all loss or expense (including costs and attorney's fees) by reason of liability imposed by law upon the Owner and the Design Professional, their consultants, agents, and employees for damages because of bodily injury, including death at any time resulting therefrom, sustained by any person or persons or on account of damage to property, including loss of use thereof, arising out of or in consequence of the performance of this work, whether such injuries to persons or damage to property is due, or claimed to be due, to the negligence of the contractor, his subcontractors, the Owner, the Design Professional, and their

consultants, agents, and employees, except only such injury or damage as shall have been occasioned by the sole negligence of the Owner, the Design Professional, and their agents and/or consultants.

**Limits of Liability**

Umbrella or Excess Liability Limit

\$ 1,000,000

Owner's Protective

Bodily Injury - Each Occurrence

\$ 1,000,000

Property Damage - Each Occurrence

\$ 250,000

Property Damage - Aggregate

\$ 500,000

Or Combined Single Limit

\$ 1,500,000

**Additional Named Insured \***

**The "Design Professional"**

**The City of Southfield**

\*On all policies other than Workers Compensation.

Advance Notice of Cancellation or Intent Not to Renew is to be furnished the Owner at the following address:

Attention: Purchasing Department  
P.O. Box 2055  
Southfield, MI 48037-2055

**PERFORMANCE BOND**

KNOW ALL MEN BY THESE PRESENTS, That we, the undersigned \_\_\_\_\_

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

\_\_\_\_\_ as Principal,

and \_\_\_\_\_

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

of \_\_\_\_\_ as Sureties,

are hereby held and firmly bound unto the \_\_\_\_\_

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

in the full and just sum of \_\_\_\_\_

\_\_\_\_\_ Dollars

(\$ \_\_\_\_\_) for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_ .

The condition of the above obligation is such that if said \_\_\_\_\_

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

shall well and faithfully do and perform the things agreed by \_\_\_\_\_

to be done and performed by the annexed contract, according to the terms thereof, then this obligation shall be void; otherwise, the same shall remain in full force and effect.



It is mutually understood and agreed that in cases where changes are required, either by order of the Design Professional, or Owner, or by mutual agreement, such change or changes shall not modify, discharge or release this bond.

\_\_\_\_\_ (Seal)

\_\_\_\_\_

\_\_\_\_\_ (Seal)  
Principal

\_\_\_\_\_

\_\_\_\_\_ (Seal)

\_\_\_\_\_

\_\_\_\_\_ (Seal)  
Surety

Signed, Sealed and Delivered  
in the Presence of:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**LABOR AND MATERIAL BOND**

KNOW ALL MEN BY THESE PRESENTS, That we \_\_\_\_\_

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

of \_\_\_\_\_, hereinafter called the Principal,

and \_\_\_\_\_

\_\_\_\_\_

of \_\_\_\_\_, hereinafter called the Surety,

are held and firmly bound unto the People of the State of Michigan, in the sum of \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_ ) to the payment whereof,

well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this \_\_\_\_\_ day of \_\_\_\_\_, A.D., 20 \_\_\_\_\_.

WHEREAS, The above named Principal has entered into a contract with the \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

dated the \_\_\_\_\_ day of \_\_\_\_\_, A.D., 20 \_\_\_\_\_ wherein said

Principal has covenanted and agreed as follows, to-wit:

To furnish all the labor and material \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

AND WHEREAS, This bond is given in compliance with and subject to the provisions of Act No. 213 of the Public Acts of Michigan, for the year 1963, and as may be amended by other Public Acts of Michigan.

NOW, THEREFORE, The condition of this obligation is such that if payment shall be made by the Principal to any Subcontractor or by him or any Subcontractor as the same may become due and payable of all indebtedness which may arise from him to a Subcontractor or party performing labor or furnishing materials or supplies or any Subcontractor to any person, firm, or corporation on account of any labor performed or materials or supplies furnished in the performance of said contract, then this obligation shall be void; otherwise, the same shall be in full force and effect.

AND PROVIDED, That any alterations which may be made in the items of said contract, or in the work to be done under it, or the giving by the party of the first part to said contract, of any extension of time for the performance of said contract, or any other forbearance on the part of either party to the other, shall not in any way release the Principal and the Surety, or either of them, their heirs, executors, administrators, successors or assigns from any liability hereunder, notice to the Surety of any such alteration, extension, or forbearance being hereby waived.

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Principal

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Surety

Signed, Sealed and Delivered  
in the Presence of:

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**MAINTENANCE AND GUARANTEE BOND**

BOND NO. \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS, That \_\_\_\_\_

Address: \_\_\_\_\_, as Principal,  
and \_\_\_\_\_

Address: \_\_\_\_\_, as Surety,

are held and firmly bound unto the City of Southfield, Oakland County, Michigan, in the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_ ) good and lawful money of the United States of America, to be paid to said City of Southfield, Michigan, its legal representatives, successors and assigns, for which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, and each and every one of them jointly and severally, firmly by these presents.

Sealed with our seals and dated this \_\_\_\_\_ day of \_\_\_\_\_, A.D., 20\_\_.

WHEREAS, the above named principal has entered into a certain written contract (the "Contract") with \_\_\_\_\_ dated this \_\_\_\_\_ day of \_\_\_\_\_, A.D., 20\_\_ wherein said Principal covenanted and agreed as follows, to wit:

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

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that by and under said contract, the above named Principal has agreed with \_\_\_\_\_

\_\_\_\_\_ that for a period of two years from the date of final acceptance by the City of Southfield of all Project work identified in the Contract to keep in good order and repair any defect in all the work done under said contract either by the Principal or his Subcontractors, or his material suppliers, that may develop during said period due to improper materials, defective equipment, workmanship or arrangements, and any other work affected in making good such imperfections, shall also be made good, all without expense to the City of Southfield, Michigan, by notice served in writing, either personally or by mail,

on the Principal at (address) \_\_\_\_\_

OR their legal representatives, or successors, or on the surety at (address) \_\_\_\_\_

WILL PROCEED at once to make such repairs as directed by said City of Southfield, Michigan, and in case of failure so to do within one week from the date of service of such notice, or within a reasonable time not less than one week, as shall be fixed in said notice, then the said City of Southfield, Michigan, shall have the right to purchase such materials and employ such labor and equipment as may be necessary for the purpose, and to undertake, do and make such repairs, and charge the expense thereof to, and receive same from said Principal or Surety. If any repair is necessary to be made at once to protect life and property, then and in that case, the said City of Southfield, Michigan, may take immediate steps to repair or barricade such defects without notice to the contractor. In such accounting the said City of Southfield, Michigan, shall not be held to obtain the lowest figures for the doing of the work, or any part thereof, but all sums actually paid therefor shall be charged to the Principal or Surety. In this connection the judgment of the City of Southfield, Michigan, is final and conclusive. If the said Principal for a period of two years from the date of final acceptance by the City of Southfield of all Project work identified in the Contract shall keep work so constructed under said contract in good order and repair, and shall whenever notice is given as herein before specified, at once proceed to make repair as in said notice directed, or shall reimburse said City of Southfield, Michigan, from all suits and actions for damages of every name and description brought or claimed against it for or on account of any injury or damage to person or property received or sustained by any party or parties, by or from any of the acts of servants, agents, or employees, in the prosecution of the work included in said contract, and from any and all claims arising under the Workman's Compensation Act, so called, of the State of Michigan, then the above obligation shall be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have cause this instrument to be executed by their respective authorized officers this \_\_\_\_\_ day of \_\_\_\_\_, A.D., 20 \_\_\_\_.

Signed, Sealed and Delivered  
in the Presence of:

\_\_\_\_\_  
(LS)

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

\_\_\_\_\_  
(LS)

\_\_\_\_\_

\_\_\_\_\_  
(LS)

\_\_\_\_\_

Southfield Updated 12/96

**CITY OF SOUTHFIELD  
NOTICE TO PROCEED**

TO: \_\_\_\_\_ DATE: \_\_\_\_\_  
\_\_\_\_\_  
PROJECT: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
CITY JOB No.: \_\_\_\_\_

You are hereby notified to commence WORK in accordance with the Agreement dated, \_\_\_\_\_ ,  
\_\_\_\_\_, on or before \_\_\_\_\_, and you are to complete the WORK WITHIN  
\_\_\_\_\_ consecutive calendar days thereafter.

The date of completion of all WORK is therefore \_\_\_\_\_ , \_\_\_\_\_ .

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

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

**ACCEPTANCE OF NOTICE**

Receipt of the above NOTICE TO PROCEED is hereby  
acknowledged by:

\_\_\_\_\_  
this the \_\_\_\_\_ day of \_\_\_\_\_ , 20 \_\_\_\_\_.

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

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

## **SOUTHFIELD DPW INTERIOR RENOVATION SUPPLEMENTAL PROJECT NOTES**

### **1. GENERAL**

These specifications form a part of the Specifications and Contract Documents for the **Southfield DPW Storage Building Addition** with the requirements herein specified supplementing and/or superseding those contained in the balance of the Specifications and Contract documents.

### **2. “ARCHITECT” AND “DESIGN PROFESSIONAL”**

The terms “Architect” and “Design Professional” are used interchangeably within the contract documents. All items requiring the review of the Owner’s Representative shall be directed to OHM Advisors.

### **3. EXISTING CONDITIONS**

Each bidder shall personally visit the sites of the projects and pay particular attention to the existing conditions and the salient features of the projects in order to assure himself / herself of the amount of equipment, materials, and work required to satisfy the requirements of the projects.

### **4. CONNECTIONS**

Connecting underdrain and sewer to existing or proposed sewer or manholes where preformed openings have not been cast as an integral part shall be tapped by drilling holes at 6-inch center to center around periphery of opening to create a plane of weakness before breaking out section. Non-shrink grout shall be used to seal the opening and a concrete collar shall be poured 12 inches thick around the pipe and extended 12 inches beyond the opening. Pipe connecting to pipe or structure walls shall be cut at the end to conform with the shape of the inside of the wall and shall be flush therewith. Any existing pipe broken or cracked while making the connection shall be replaced incidental to making the connection.

### **5. COOPERATION WITH OTHER CONTRACTORS**

The Contractor shall make every effort to cooperate and coordinate with all other contractors working in the area at the time of construction.

### **6. DISPOSAL OF REMOVED MATERIAL**

All materials removed; with the exception of clean fill dirt where required for fill areas indicated on the plans, shall be disposed of off-site. No exceptions will be considered, and all costs associated with transporting, disposing, etc., shall be considered as included in the appropriate bid items. When no specific bid item exists, the costs associated with compliance of this provision shall be considered incidental to the project.

### **7. WATER**

If the Contractor desires to use City water for construction, he shall obtain the required permit from the City. A hydrant connection will then be issued to him by the Water Department. The Contractor must deposit the required fee as charged by the Water Department for the use of the hydrant connection. The unused portion of the deposited fee will be refunded to the Contractor upon the return of the connection. The use of privately owned hydrant

connections is prohibited. When connections are made to hydrants, the Contractor shall promptly notify the City of Southfield Fire Department.

**8. CLEANING OF STRUCTURES**

The Contractor shall protect catch basins and manholes. All materials that enter the structures because of the Contractor's operations shall be removed immediately. Prior to final acceptance of this project, all existing and proposed structures within the area disturbed by this construction shall be thoroughly cleaned of all debris regardless of if it is preexisting or caused by the construction process.

**9. SOIL EROSION AND SEDIMENTATION CONTROL**

At the time of completion of the project, it will be the responsibility of the Contractor to remove SESC devices. If a specific bid item is not included, all soil erosion and sedimentation control costs, which may be incurred, shall be incidental.

**10. MAINTAINING SOLID WASTE (RUBBISH) SERVICES**

Rubbish collection shall not be interfered with by the Contractor's operations. If access to certain areas is blocked by the Contractor's operations, he shall transport the rubbish himself to a location accessible to the collection crews, incidental to the project.

**11. HOURS OF OPERATION**

The City of Southfield permits construction between the hours of 7:00 A.M. and 7:00 P.M., Monday through Saturday, unless otherwise authorized by the city. Should an emergency arise, which would require working beyond the hours mentioned, the Contractor shall contact the City Engineer for approval for work beyond the permitted hours. The form can be found in the building department category at the following link:

<https://www.cityofsouthfield.com/departments/city-services/forms-applications>

**12. INSURANCE FOR GRASS GROWTH**

This contract will not receive final acceptance by the City until all work is completed and all disturbed landscape is restored to the same approximate condition as existed prior to construction. Grass restoration shall be per the specifications.

To ensure a dense growth of grass along all landscaped areas, a minimum amount of \$10,000.00 may be withheld from payment to the Contractor. Upon satisfactory grass growth, the City will promptly make payment to the Contractor.

**13. SEEDING WITH 4" TOPSOIL SURFACE**

All disturbed lawn areas shall be restored unless directed otherwise by the Design Professional. Grass restoration at each individual work location shall be completed no later than two weeks after the completion of paving, sidewalk, or utility work at that location. **Failure of the Contractor to perform grass restoration work in this prompt and timely fashion will result in the suspension of all other contract operations until the grass restoration has been completed in a satisfactory manner as directed by the Design**



**Professional.**

**14. PORTABLE LAVATORIES**

The Contractor shall provide, upon the direction of the Field Engineer, one or more portable field lavatories such as the "Porta-John" or equivalent. Portable lavatories and their proper maintenance by the Contractor for the duration of the project shall not be paid for separately but shall be considered incidental to the project. Portable lavatories shall be moved from the construction site within five days of completing the project.

**15. WATER STOP BOX AND GAS VALVE ADJUSTMENTS**

All water stops box and gas valve adjustments necessary shall be incidental to this project. The Contractor shall be responsible for adjusting water stop boxes. The gas company shall be responsible for adjusting gas valves.

**17. TESTING**

Owner will engage testing agency to perform the following tests:

- Inspection of subgrade
- Compaction of subgrade
- Concrete slump, air content and compressive strength

Quality assurance testing for materials by Contractor will be required in accordance with technical specification sections.

Division	Section Title	Issue Date
<b>DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS</b>		
00 31 32	GEOTECHNICAL DATA REPORT BY G2 DATED NOVEMBER 10, 2022	11/13/2023
<b>DIVISION 01 - GENERAL REQUIREMENTS</b>		
01 10 00	SUMMARY	11/13/2023
01 22 00	UNIT PRICES	11/13/2023
01 23 00	ALTERNATES	11/13/2023
01 25 00	SUBSTITUTION PROCEDURES	11/13/2023
01 26 00	CONTRACT MODIFICATION PROCEDURES	11/13/2023
01 29 00	PAYMENT PROCEDURES	11/13/2023
01 31 00	PROJECT MANAGEMENT AND COORDINATION	11/13/2023
01 33 00	SUBMITTAL PROCEDURES	11/13/2023
01 40 00	QUALITY REQUIREMENTS	11/13/2023
01 50 00	TEMPORARY FACILITIES AND CONTROLS	11/13/2023
01 60 00	PRODUCT REQUIREMENTS	11/13/2023
01 73 00	EXECUTION	11/13/2023
01 77 00	CLOSEOUT PROCEDURES	11/13/2023
01 78 23	OPERATION AND MAINTENANCE DATA	11/13/2023
01 78 39	PROJECT RECORD DOCUMENTS	11/13/2023
<b>DIVISION 03 - CONCRETE</b>		
03 10 00	CONCRETE FORMING AND ACCESSORIES	11/13/2023
03 20 00	CONCRETE REINFORCING	11/13/2023
03 30 00	CAST-IN-PLACE CONCRETE	11/13/2023
<b>DIVISION 08 - OPENINGS</b>		
08 36 13	SECTIONAL DOORS	11/13/2023
08 91 19	FIXED LOUVERS	11/13/2023
<b>DIVISION 09 - FINISHES</b>		
09 67 23	RESINOUS FLOORING	11/13/2023
09 91 00	PAINTING	11/13/2023
<b>DIVISION 13 - SPECIAL CONSTRUCTION</b>		
13 34 19	METAL BUILDING SYSTEMS	11/13/2023

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

23 05 93	TESTING, ADJUSTING, AND BALANCING FOR HVAC	11/13/2023
23 09 23.16	GAS INSTRUMENTS	11/13/2023
23 34 23	HVAC POWER VENTILATORS	11/13/2023

**DIVISION 26 - ELECTRICAL**

26 05 19	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES	11/13/2023
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS	11/13/2023
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS	11/13/2023
26 05 33.13	CONDUITS FOR ELECTRICAL SYSTEMS	11/13/2023
26 05 43	UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS	11/13/2023
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS	11/13/2023
26 22 13	LOW-VOLTAGE DISTRIBUTION TRANSFORMERS	11/13/2023
26 24 16	PANELBOARDS	11/13/2023
26 27 26	WIRING DEVICES	11/13/2023
26 29 13.03	MANUAL AND MAGNETIC MOTOR CONTROLLERS	11/13/2023
26 50 00	LIGHTING	11/13/2023
26 56 19	LED EXTERIOR LIGHTING	11/13/2023

**DIVISION 31 - EARTHWORK**

31 10 00	SITE CLEARING	11/13/2023
31 20 00	EARTH MOVING	11/13/2023

**DIVISION 32 - EXTERIOR IMPROVEMENTS**

32 11 00	BASE COURSES	11/13/2023
32 13 13	CONCRETE PAVING	11/13/2023

**DIVISION 33 - UTILITIES**

33 41 00	STORM SEWERS, UNDERDRAINS AND DRAINAGE STRUCTURES	11/13/2023
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## DOCUMENT 00 31 32 - GEOTECHNICAL DATA

### 1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. A geotechnical investigation report for Project, prepared by G2 Consulting Group , dated November 10, 2022 , is available for viewing as appended to this Document.
  - 1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
  - 2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

END OF DOCUMENT 00 31 32



Report of Geotechnical Investigation

**Proposed DPW Pole Barn  
22501 Clara Lane  
Southfield, Michigan**

Latitude: 42.490781° N  
Longitude: 83.292082° W

Prepared for:

OHM Advisors  
1145 Griswold Street, Suite 200  
Detroit, Michigan 48226

G2 Project No. 220736  
November 10, 2022



CONSULTING  
GROUP

November 10, 2022

Mr. Zachary Hampton, P.E.  
Project Engineer  
OHM Advisors  
1145 Griswold Street, Suite 200  
Detroit, Michigan 48226

Re: Report of Geotechnical Investigation  
Proposed DPW Pole Barn  
22501 Clara Lane  
Southfield, Michigan  
G2 Project No. 220736

Dear Mr. Hampton,

We have completed the geotechnical investigation for proposed Pole Barn to be constructed at the City of Southfield Department of Public Works (DPW) property within the City of Southfield, Michigan. This report presents the results of our observations and analyses and our recommendations for earthwork operations, foundation design, and construction considerations as they relate to the geotechnical conditions on site.

We appreciate the opportunity to be of service to OHM Advisors on this project and we look forward to discussing the recommendations presented herein. In the meantime, if you have any questions regarding this report or any other matter pertaining to the project, please contact us.

Sincerely,

**G2 Consulting Group, LLC**

Jeffrey M. Hayball, P.E.  
Project Manager

Noel J. Hargrave-Thomas, P.E.  
Principal

JMH/JLB/ljv



## EXECUTIVE SUMMARY

The project includes construction of a new pole barn on the property of the City of Southfield Department of Public Works located at 22501 Clara Lane, Southfield, Michigan. The proposed new structure will be single-story and slab-on grade. The finished floor elevation of the proposed building was not available upon completion of this report. We assume the finish floor elevation will be near existing grades.

Medium compact gravelly sand fill is present at the ground surface of boring B-2 and extends to an approximate depth of 3 feet. Very stiff to hard silty clay fill is present at the ground surface of the boring B-1 and underlies the gravelly sand fill within boring B-2 and extends to an approximate depth of 6 feet below grade. Native very stiff silty clay is present below the silty clay fill within the borings and extends to the explored depth of 15 feet. No measurable groundwater was observed within the borings during or upon completion of drilling operations.

The finished floor elevation for the proposed building was not available upon completion of this report. However, we assume the finish floor elevation will be near or slightly above existing grades. Based upon the existing subgrade conditions and anticipated loading conditions, we recommend the proposed structures be supported on conventional strip and spread footing foundations. In general, foundations should extend through the existing fill material and bear on the underlying native very stiff to hard silty clay. We anticipate foundation excavations may extend up to 6 feet below existing grades. However, it appears the existing fill soils may have been placed in an engineered manner and generally appear suitable for support of the provided the potential for settlement of the structure can be tolerated.

We recommend a net allowable bearing pressure of 4,000 psf be used for design of foundations bearing on the native very stiff silty clay at an approximate bearing depth of 6 feet. Alternately, we recommend a net allowable bearing pressure of 2,000 psf be used for design of foundations for the building bearing on the existing very stiff silty clay fill. We recommend additional shallow hand auger borings be performed within the bottom of the footing excavation during construction operations to confirm the existing fill soils are consistent with the soil conditions encountered within the soil borings. Fill which contains debris or organic matter should have the foundation extend through these soils and bear within the underlying native silty clay.

Exterior foundations should bear at a minimum depth of 3-1/2 feet below finished grade for protection against frost heave. Interior foundations may bear at shallower depths provided suitable native bearing soils are present and foundations are protected from frost penetration during construction and service life operations. A G2 engineer should be on site during construction to observe the excavations, measure the bearing depths, and verify the adequacy of the bearing soils.

No groundwater was encountered within the soil borings during or upon completion of drilling operations. We anticipate any significant groundwater accumulations within construction excavation can be controlled from pumping from properly constructed sumps. Caving and sloughing of the existing upper granular fill soils will occur during foundation excavation operations. Therefore, the contractor should be prepared to over excavate and form the foundations, as necessary. The sides of spread and/or strip footings should be constructed straight and vertical to reduce the risk of frozen soil adhering to the concrete and raising the foundations.

Do not consider this summary separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.



## PROJECT DESCRIPTION

The project includes construction of a new pole barn on the property of the City of Southfield Department of Public Works located at 22501 Clara Lane, Southfield, Michigan. The proposed new structure will be single-story and slab-on-grade. The finished floor elevation of the proposed building was not available upon completion of this report. We assume the finish floor elevation will be near existing grades. Loading conditions were not available upon completion of this report. We anticipate loads for the proposed structures will be relatively lightly loaded and be subject to wall loads ranging from 1 to 2 kips per linear foot and individual column loads ranging from 25 to 50 kips. When loading conditions become available, G2 must be notified so that we can review the recommendations provided within this investigation.

The purpose of our exploration will be to determine and evaluate the general subsurface conditions at the site and develop related foundation recommendations for the support of the proposed structure and construction considerations as they relate to the site.

## SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering in this area. Our scope of services for this project is as follows:

1. We drilled two (2) soil borings within the general footprint of the proposed structure, extending to a depth of 15 feet each.
2. We performed laboratory testing on representative samples obtained from the soil borings. Laboratory testing included visual engineering classification, natural moisture content, dry density, and unconfined compressive strength determinations.
3. We prepared this preliminary engineering report. The report includes recommendations regarding foundation types suitable for the soil conditions encountered, allowable bearing capacities of the anticipated bearing soil layers, estimated settlement, and construction considerations related to site preparation and foundation construction.

## FIELD OPERATIONS

OHM Advisors (OHM), in conjunction with G2 Consulting Group, LLC (G2), selected the number, depth, and location of the soil borings. The soil boring locations were determined in the field by conventional taping methods from existing site features by a G2 staff engineer prior to the execution of the drilling operations. The approximate soil boring locations are shown on the Soil Boring Location Plan, Plate No. 1 in the Appendix. Ground surface elevations were not available upon completion of this report.

The soil borings were drilled using a truck-mounted rotary drilling rig. Continuous flight, 2-1/4-inch inside diameter, hollow-stem augers were used to advance the boreholes to the explored depths. Continuous flight, 2-1/4-inch, inside diameter hollow-stem augers were used to advance the boreholes to the explored depths. Soil samples were obtained at intervals of 2-1/2 feet within the upper 10 feet and an additional sample was obtained at 15 feet. These samples were obtained by the Standard Penetration Test method (ASTM D 1586), which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is generally driven three successive 6-inch increments with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). Blow counts for each 6-inch increment and the resulting N-values are presented on the individual soil boring logs.





Soil samples were placed in sealed containers in the field and brought to our laboratory for testing and classification. During field operations, the drilling crew maintained logs of the encountered subsurface conditions, including changes in stratigraphy and observed groundwater levels. The final boring logs are based on the field logs supplemented by laboratory soil classification and test results. After completion of drilling operations, the boreholes were backfilled with auger cuttings.

## **LABORATORY TESTING**

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to foundation design and site preparation. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System.

Laboratory testing included natural moisture content, dry density, and unconfined compressive strength determinations. The unconfined compressive strengths were determined by ASTM Test Method D2166 and using a spring-loaded hand penetrometer. Per ASTM D2166, the unconfined compressive strength of cohesive soils is determined by axially loading a small cylindrical soil sample under a slow rate of strain. The unconfined compressive strength is defined as the maximum stress applied to the soil sample before shear failure. If shear failure does not occur prior to a total strain of 15 percent, the unconfined compressive strength is defined as the stress at a strain of 15 percent. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring-loaded cylinder.

The results of the moisture content, dry density, and unconfined compressive strength laboratory tests are indicated on the soil boring logs at the depths the samples were obtained. Unconfined Compressive Strength Test are shown graphically on Figure No. 3 within the Appendix. We will hold the soil samples for 60 days from the date of this report. If you would like the samples, please let us know.

## **SITE DESCRIPTION**

The proposed site is located at 22501 Clara Lane within the City of Southfield, Oakland County, Michigan. The proposed structure will be constructed within the eastern portion of the property. The proposed building area is generally clear of grass and topsoil. A stockpile is present within the generally area of the proposed project. Site grades were not available upon completion of this report, however, it appear grades surrounding the stockpile are relatively flat.

## **SOIL CONDITIONS**

Gravelly sand fill is present at the ground surface of boring B-2 and extends to an approximate depth of 3 feet. Silty clay fill is present at the ground surface of the boring B-1 and underlies the gravelly sand fill within boring B-2 and extends to an approximate depth of 6 feet below grade. Native silty clay is present below the silty clay fill within the borings and extends to the explored depth of 15 feet.

The gravelly sand fill is medium compact with a Standard Penetration Test (SPT) N-value of 18 blows per foot. The silty clay fill is very stiff to hard with moisture contents ranging from 13 to 19 percent and unconfined compressive strengths ranging from 5,000 to 8,500 pounds per square foot (psf). The native silty clay is very stiff in consistency with natural moisture contents ranging from 15 to 23 percent, dry densities ranging from 102 to 105 pounds per cubic foot (pcf), and unconfined compressive strengths ranging from 4,450 to 6,000 psf.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between and away from the boring locations. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transition may be more gradual than what is shown. We have prepared the individual soil boring logs on the basis of the laboratory soil classification and testing in conjunction with the field logs of the encountered soil conditions.



The Soil Boring Location Plan, Plate No. 1, Soil Boring Logs, Figure Nos. 1 and 2, and Unconfined Compressive Strength Test, Figure No. 3, are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the soil boring logs and elsewhere in this report is presented on Figure No. 4.

## **GROUNDWATER CONDITIONS**

No measurable groundwater was observed within the borings during or upon completion of drilling operations. Fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation. It should also be noted that groundwater observations made during drilling operations in predominantly cohesive soils are not necessarily indicative of the static groundwater level. This is due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow.

## **FOUNDATION RECOMMENDATIONS**

Based upon the existing subgrade conditions and anticipated loading conditions, we recommend the proposed structures be supported on conventional strip and spread footing foundations. In general, foundations should extend through the existing fill material and bear on the underlying native very stiff to hard silty clay. We anticipate foundation excavations may extend up to 6 feet below existing grades. However, it appears the existing fill soils may have been placed in an engineered manner and generally appear suitable for support of the provided the potential for settlement of the structure can be tolerated.

We recommend a net allowable bearing pressure of 4,000 psf be used for design of foundations bearing on the native very stiff silty clay. Alternately, we recommend a net allowable bearing pressure of 2,000 psf be used for design of foundations for the building bearing on the very stiff silty clay fill. We recommend additional shallow hand auger borings be performed within the bottom of the footing excavation during construction operations to confirm the existing fill soils are consistent with the soil conditions encountered within the soil borings. Fill which contains debris or organic matter should have the foundation extend through these soils and bear within the underlying native silty clay.

Exterior foundations should bear at a minimum depth of 3-1/2 feet below finished grade for protection against frost heave. Interior foundations may bear at shallower depths provided suitable native bearing soils are present and foundations are protected from frost penetration during construction and service life operations. A G2 engineer should be on site during construction to observe the excavations, measure the bearing depths, and verify the adequacy of the bearing soils.

Continuous wall or strip footings should be at least 12 inches in width and isolated spread footings should be at least 30 inches in their least dimension. To achieve a change in the level of the strip footings, such as may be necessary due to varying fill depths, the footings should be gradually stepped at a grade no steeper than two units horizontal to one unit vertical. We recommend all strip footings be suitably reinforced to minimize the effects of differential settlements associated with local variations in subsoil conditions.

If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structure bearing within the existing native soils below an approximate depth of 6 feet should be within 1 inch and 1/2 inch, respectively. We estimate total and differential settlements for the complete structure bearing within the existing fill soils at shallower depths should be within 1-1/2 inch to 3/4 inch. We expect settlements of these magnitudes are within tolerable limits for the types of structures proposed.



## **SITE PREPARATION**

We anticipate earthwork operations will consist of removing the stockpile within the footprint of the proposed structure, fine grading the site to the proposed grades, proof rolling the exposed subgrade, placing and compacting engineered fill to achieve final grades, preparing subgrade for floor slab support, and excavating for building foundations. We recommend all earthwork operations be performed in accordance with comprehensive specifications and be properly monitored in the field by qualified personnel under the direction of a licensed engineer.

At the start of the earthwork operations, topsoil and pavements must be completely removed in their entirety from within the footprint of the proposed structures and pavement expansion. Following removal of the surficial topsoil, vegetation, and pavement and prior to placement of engineered fill, the exposed subgrade should be evaluated for stability by a quality geotechnical engineering technician. We anticipate cohesive soils will be present across the exposed subgrade. Therefore, we recommend proof rolling the cohesive subgrade soils with a full loaded tri-axle dump truck and visually inspected by a qualified engineering technician or geotechnical engineer for instability and/or unsuitable soil conditions. Unstable soils or soils exhibiting excessive instability, such as severe rutting or pumping, should be undercut to expose stable soils. Resulting excavations should be backfilled with engineered fill.

We recommend limiting construction traffic on the exposed subgrade to minimize damage, as well as limiting exposure of the subgrade to inclement weather. All site work and foundation construction should occur during the periods of dry weather to minimize the risk of instability and excessive undercuts.

Engineered fill should be free of organic matter, frozen soil, clods, or other harmful material. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade. Engineered fill should be placed in uniform horizontal layers, not more than 9 inches in loose thickness. The engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction test (ASTM D 1557).

We recommend using granular engineered fill within confined areas such as adjacent to foundation walls. Granular engineered fill is generally more easily compacted than cohesive soils within these confined areas. Additionally, the proper placement and compaction of backfill within these areas is imperative to provide adequate support for overlying floor slabs.

## **FLOOR SLAB RECOMMENDATIONS**

Provided the risk of some floor slab settlement can be tolerated, we anticipate the existing fill soils present within borings will be suitable for support of the proposed building floor slab following earthwork operations as described in the Site Preparation section of this report. We recommend a subgrade modulus of up to 90 pounds per cubic inch (pci) over the existing fill soils.

If the risk of floor slab settlement cannot be tolerated, the existing fill must be completely removed and replaced with engineered fill for the support of floor slabs. Floor slabs supported on engineered fill with no existing fill soils underlying the engineered fill can be designed for a subgrade modulus of 150 pci. Provided the subgrade soils pass a proof roll or proof compaction evaluation, we believe the risk is low that excessive floor slab settlement will occur.

We recommend at least 4 inches of clean coarse sand be placed between the subgrade and the bottom of the floor slab for use as a capillary break to reduce moisture transmission through the concrete floors and to reduce the potential for concrete curling. If moisture sensitive floor coverings are planned or if greater protection against vapor transmission is desired, a vapor barrier consisting of 10-mil plastic sheeting, or equivalent, may be placed on the sand layer beneath floor slabs. However, additional floor slab curing techniques will be required especially if floor slab placement occurs in the winter months to



prevent floor slab curling. The floor slab should be isolated from the foundation system to allow for independent movement.

## **CONSTRUCTION CONSIDERATIONS**

No groundwater was encountered within the soil borings during or upon completion of drilling operations. We anticipate any significant groundwater accumulations within construction excavation can be controlled from pumping from properly constructed sumps.

Caving and sloughing of the existing granular fill soils will occur during foundation excavation operations. Therefore, the contractor should be prepared to over excavate and form the foundations, as necessary. The sides of spread and/or strip footings should be constructed straight and vertical to reduce the risk of frozen soil adhering to the concrete and raising the foundations. All excavations should be backfilled with engineered fill when supporting overlying structures such as floor slabs.

Care should always be exercised when excavating near existing structures, roadways, or utilities to avoid undermining. In no case should excavations extend below the level of adjacent building or infrastructure unless underpinning is planned.

Where excavations extend deeper than 5 feet or where human entry is planned and sufficient space is available, we recommend maximum slopes of 1 horizontal units to 1 vertical unit (1H:1V) for sloped excavations within the very stiff to hard cohesive soils. All excavations should be safely sheeted, shored, sloped, or braced in accordance with MI-OSHA requirements. If material is stored or equipment is operated near an excavation, stronger shoring must be used to resist the extra pressure due to the superimposed loads.

## **GENERAL COMMENTS**

We have formulated the evaluations and recommendations presented in this report relative to site preparation and foundations on the basis of data provided to us relating to the project location, type of structure, and anticipated surface grades for the proposed development. Once loading conditions have been determined, G2 must be notified so we can review the recommendations presented within our report. Any significant changes in scope to this project should be brought to our attention for review and evaluation with respect to the prevailing subsurface conditions.

The scope of the present investigation was limited to evaluation of subsurface conditions for the support of the building foundations and other related aspects of the development. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation. If changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

We have based the analyses and recommendations submitted in this report upon the data from soil borings performed at the approximate locations shown on the Soil Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur between the actual boring locations and the actual structure locations. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

Soil conditions at the site could vary from those generalized on the basis of soil borings made at specific locations. It is, therefore, recommended that G2 Consulting Group, LLC be retained to provide soil engineering services during site preparation, excavation, and foundation construction phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations. Also, this allows design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction.

## APPENDIX

Soil Boring Location Plan

Plate No. 1

Soil Boring Logs

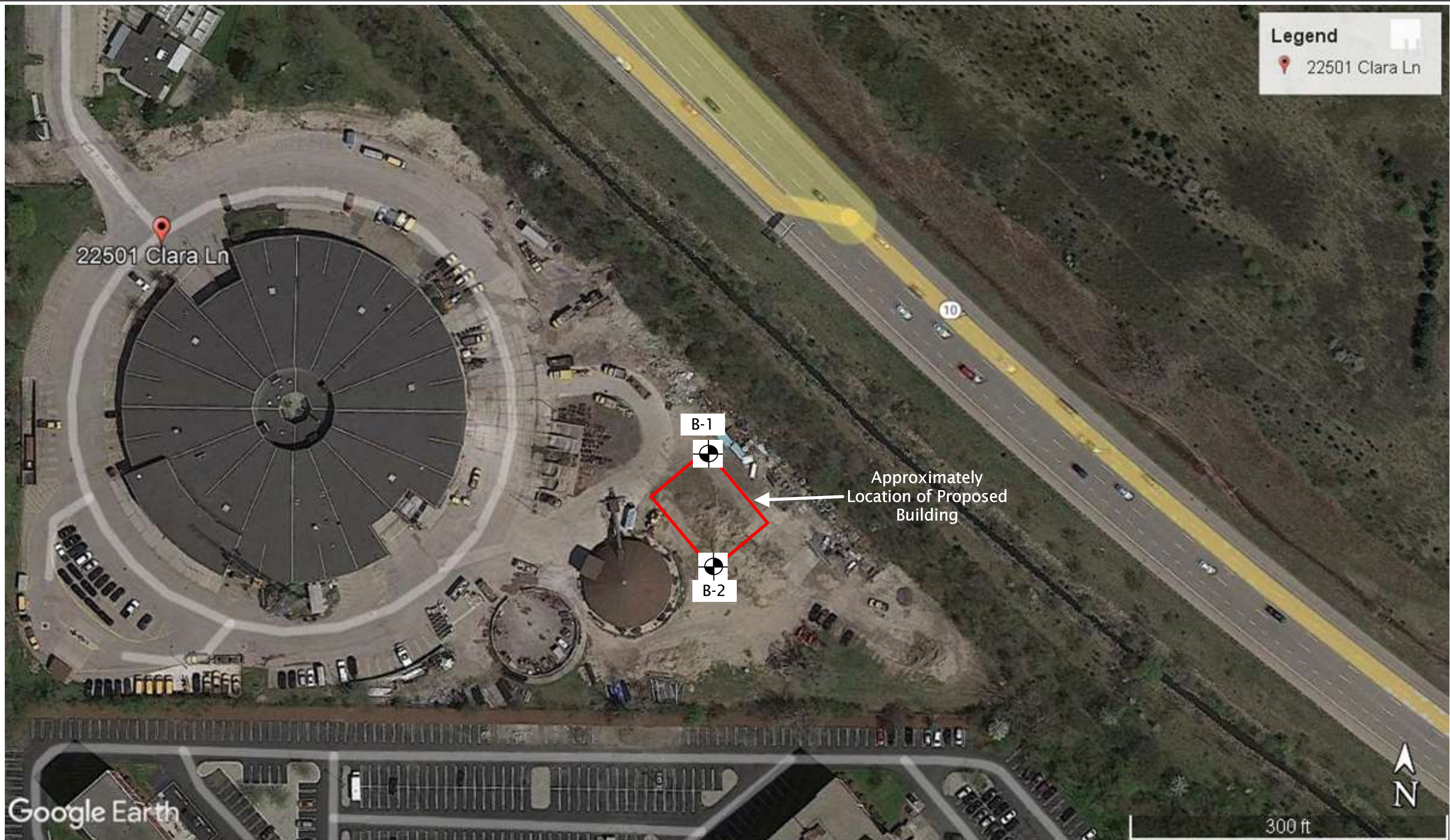
Figure Nos. 1 and 2

Unconfined Compressive Strength Test

Figure No. 3

General Notes Terminology


Figure No. 4




**Legend**  
 22501 Clara Ln



**Legend**

 Soil Borings performed by Xterra Drilling on October 4, 2022

<b>Soil Boring Location Plan</b>			
Proposed DPW Pole Barn 22501 Clara Lane Southfield, Michigan			
 CONSULTING GROUP	Project No. 220736		
	Drawn by: JMH		
	Date: 11/10/22	Plate No. 1	
	Scale: NTS		

Project Name: Proposed DPW Pole Barn

Project Location: 22501 Clara Lane  
Southfield, Michigan

G2 Project No. 220736

Latitude: N/A Longitude: N/A



Soil Boring No. **B-1**  
**CONSULTING GROUP**

SUBSURFACE PROFILE			SOIL SAMPLE DATA							
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)	
5		Fill: Very Stiff to Hard Brown Silty Clay with trace sand and gravel	5	S-1	7 8 9	17	13.6		8500*	
			6.0	S-2	4 4 6	10	18.6		5000*	
				S-3	2 4 6	10	23.3	102	4450	
10				10	S-4	2 4 5	9	20.5		4500*
				12.0						
15		Very Stiff Gray Silty Clay with trace sand and gravel	15	S-5	3 4 5	9	17.2		4500*	
		End of Boring @ 15 ft								
20			20							

SOIL / PAVEMENT BORING 220736.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 10/11/22

Total Depth: 15 ft  
 Drilling Date: October 4, 2022  
 Inspector:  
 Contractor: Xterra Drilling  
 Driller: J. Bowerman

Water Level Observation:  
 Dry during and upon completion

Notes:  
 \* Calibrated Hand Penetrometer

Drilling Method:  
 2-1/4 inch inside diameter hollow-stem augers

Excavation Backfilling Procedure:  
 Auger cuttings

Figure No. 1

Project Name: Proposed DPW Pole Barn

Project Location: 22501 Clara Lane  
Southfield, Michigan

G2 Project No. 220736

Latitude: N/A Longitude: N/A



Soil Boring No. **B-2**  
**CONSULTING GROUP**

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
	[Cross-hatched pattern]	Fill: Medium Compact Brown Gravelly Sand with trace silt							
			3.0	S-1	10 10 8	18			
5	[Cross-hatched pattern]	Fill: Very Stiff Brown Silty Clay with trace sand and gravel							
			5	S-2	5 5 6	11	13.0		5500*
	[Diagonal hatched pattern]	Very Stiff Brown and Gray Silty Clay with trace sand and gravel							
			6.0	S-3	3 6 7	13	20.6	105	5280
10	[Diagonal hatched pattern]	Very Stiff Brown and Gray Silty Clay with trace sand and gravel							
			10	S-4	3 4 8	12	18.5		6000*
	[Diagonal hatched pattern]	Very Stiff Gray Silty Clay with trace sand and gravel							
			12.0						
15	[Diagonal hatched pattern]	End of Boring @ 15 ft							
			15.0	S-5	3 5 8	13	15.4		5500*
20			20						

SOIL / PAVEMENT BORING 220736.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 10/11/22

Total Depth: 15 ft  
 Drilling Date: October 4, 2022  
 Inspector:  
 Contractor: Xterra Drilling  
 Driller: J. Bowerman

Water Level Observation:  
 Dry during and upon completion

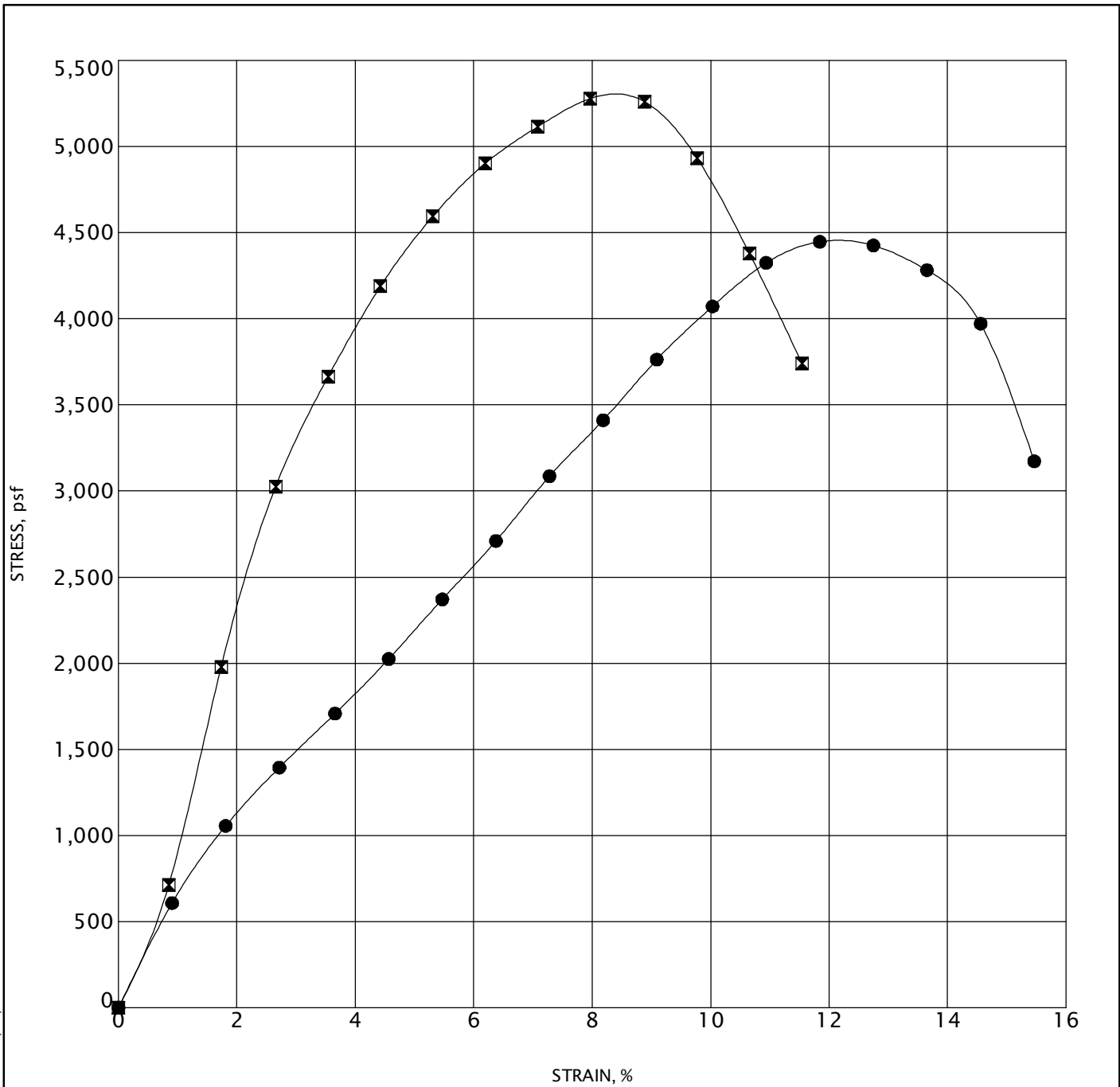
Notes:  
 \* Calibrated Hand Penetrometer

Drilling Method:  
 2-1/4 inch inside diameter hollow-stem augers

Excavation Backfilling Procedure:  
 Auger cuttings

Figure No. 2





Specimen	Classification	MC%	$\gamma_d$	UC
● B-1 S-3	Brown and Gray Silty Clay	23	102	4450
⊠ B-2 S-3	Brown and Gray Silty Clay	21	105	5280

**UNCONFINED COMPRESSIVE STRENGTH TEST**

Project Name: Proposed DPW Pole Barn  
 Project Location: 22501 Clara Lane  
 Southfield, Michigan  
 G2 Project No.: 220736



Figure No. 3

## GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

### PARTICLE SIZE

Boulders	- greater than 12 inches
Cobbles	- 3 inches to 12 inches
Gravel - Coarse	- 3/4 inches to 3 inches
- Fine	- No. 4 to 3/4 inches
Sand - Coarse	- No. 10 to No. 4
- Medium	- No. 40 to No. 10
- Fine	- No. 200 to No. 40
Silt	- 0.005mm to 0.074mm
Clay	- Less than 0.005mm

### CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

<b>Second Major Constituent (percent by weight)</b>	<b>Minor Constituent (percent by weight)</b>
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

### COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

Density Classification	COHESIONLESS SOILS Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

### SAMPLE DESIGNATIONS

- AS - Auger Sample - Cuttings directly from auger flight
- BS - Bottle or Bag Samples
- S - Split Spoon Sample - ASTM D 1586
- LS - Liner Sample with liner insert 3 inches in length
- ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
- PS - Piston Sample - 3 inch diameter unless otherwise noted
- RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).

## SECTION 01 10 00 - SUMMARY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Project information.
  2. Work covered by Contract Documents.
  3. Work performed by Owner.
  4. Contractor's use of site and premises.
  5. Coordination with occupants.
  6. Work restrictions.
  7. Specification and Drawing conventions.
  8. Miscellaneous provisions.

#### 1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
1. The project consists of a new free-standing storage building for use by the DPW. Work includes the complete removal offsite and replacement of soils as indicated to construct the building and install site surfaces and utilities to support building as indicated. A new electrical and data to be run from existing building to new building, contractor to provide all associated work to provide a completed system to the new building. Additional power, security, and lighting to be provided as indicated. Mechanical systems installed and other Work indicated in the Contract Documents.
- B. Type of Contract:
1. Project will be constructed under a single prime contract.

#### 1.3 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

#### 1.4 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Project site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
  - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

#### 1.5 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
  - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- C. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
  - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
  - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- D. Smoking and Controlled Substance Restrictions: Use of tobacco products , alcoholic beverages, and other controlled substances on Owner's property is not permitted.
- E. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

#### 1.6 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
  - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
  - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

## SECTION 01 22 00 - UNIT PRICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
  - 1. Section 01 21 00 "Allowances" for procedures for using unit prices to adjust quantity allowances.
  - 2. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
  - 3. Section 01 40 00 "Quality Requirements" for field testing by an independent testing agency.

#### 1.2 DEFINITIONS

- A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

#### 1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- C. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the Part 3 "Schedule of Unit Prices" Article contain requirements for materials described under each unit price.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. 1: Existing Material, Excavation and Haul-off.
  - 1. Description: The contract unit price shall be payment in full for all labor, materials, and equipment necessary to excavate and dispose of existing material as needed for construction of the Storage Building. The contract unit price shall include items such as removing topsoil and vegetation, excavating, grading, and compacting existing earth/materials within the site for any stockpiling, sterilizing the subgrade, and finish grading necessary to meet existing grades as depicted on the Plans. In addition, root trimming, clearing, brushing, and removal of trees under 6 inches in diameter shall be considered as part of the work
  - 2. Unit of Measurement: Cubic Yard The area shall be based upon the average length, width measurements and depth measurements as determined by the Construction Observer.

- B. Unit Price No. 2 - Engineered Fill, CI II Sand, Placement & Compaction :
1. Description: The contract unit price shall be payment in full for all labor, materials, and equipment necessary to furnish, place and compact engineered fill in order to establish grade as depicted in Plans and as outlined in the Contract Documents. Included within this work is any stockpiling, sterilizing or compaction of the subgrade, and finish grading necessary to construct the Storage Building. ". "
  2. Unit of Measurement: Cubic YardThe area shall be based upon the average length, width measurements and depth measurements as determined by the Construction Observer..

END OF SECTION 01 22 00

## SECTION 01 23 00 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

#### 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

#### 1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 : Additional 21' Bay to Building End .
  - 1. Base Bid: Provide building and site work as indicated on Drawings and as specified "."
  - 2. Alternate: Provide additional 1 Bay of building structure and associated side work. One bay building structure to include typical wall, roof, and structure along with typical floor slab and lighting. Site work to include drives on each side of the building and associated drains below grade. "."
- B. Alternate No. 2: Resinous Floor Finish



1. Base Bid: Provide sealed concrete as indicated on drawing A-101 and as specified in Section 03 33 000.
2. Alternate: Provide resinous flooring as indicated on Drawings A-101 and as specified in Section 09 67 23

END OF SECTION 01 23 00

## SECTION 01 25 00 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 01 21 00 "Allowances" for products selected under an allowance.
  - 2. Section 01 23 00 "Alternates" for products selected under an alternate.
  - 3. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

#### 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use form acceptable to Architect.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
    - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
    - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES .

- j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

#### 1.5 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

#### 1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Substitution request is fully documented and properly submitted.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.
    - f. Requested substitution has been coordinated with other portions of the Work.
    - g. Requested substitution provides specified warranty.
    - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

## SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
  - 2. Section 01 31 00 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

#### 1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 .

#### 1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use forms acceptable to Architect .
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect .
  - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 4. Include costs of labor and supervision directly attributable to the change.
  - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times,

and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect .

#### 1.4 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 01 21 00 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 01 22 00 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

#### 1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701 .

#### 1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 . Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

## SECTION 01 29 00 - PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.
  - 2. Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.
  - 3. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

#### 1.2 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

#### 1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Owner's name.
    - c. Owner's Project number.
    - d. Name of Architect.
    - e. Architect's Project number.
    - f. Contractor's name and address.
    - g. Date of submittal.
  - 2. Arrange schedule of values consistent with format of AIA Document G703 .
  - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
  - 4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    - a. Differentiate between items stored on-site and items stored off-site.
  - 5. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by

measured quantity. Use information indicated in the Contract Documents to determine quantities.

6. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
7. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

#### 1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: Submit Application for Payment to Architect by the first day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month .
  1. Submit draft copy of Application for Payment five days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
  1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
  2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.



- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of values.
  3. Contractor's construction schedule (preliminary if not final).
  4. Schedule of unit prices.
  5. Submittal schedule (preliminary if not final).
  6. List of Contractor's staff assignments.
  7. Copies of building permits.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
    - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 77 00 "Closeout Procedures."
  2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Certification of completion of final punch list items.
  3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  4. Updated final statement, accounting for final changes to the Contract Sum.
  5. AIA Document G706.
  6. AIA Document G707.
  7. Evidence that claims have been settled.
  8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  9. Final liquidated damages settlement statement.
  10. Proof that taxes, fees, and similar obligations are paid.
  11. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

City of Southfield  
DPW Storage Building  
OHM PROJECT # 0153220070

PAYMENT PROCEDURES  
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## SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. RFIs.
  - 3. Contractor's use of Architects CAD files
  - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
  - 1. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

#### 1.2 DEFINITIONS

- A. RFI: Request for Information from Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.3 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
  - 1. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.
- D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.

- E. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
  
- F. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.
  
- G. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion

#### 1.4 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  - 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
  
- B. RFI Forms: AIA Document G716 or form with similar information approved by Architect.
  - 1. Attachments shall be electronic files in PDF format.
  
- C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
  - 1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
  - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

- D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log the day before progress meetings or no longer than bi-weekly to team . Include the following:
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number, including RFIs that were returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

#### 1.5 CONTRACTOR'S USE OF ARCHITECTS CAD FILES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
  2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
  3. The Contractor, Subcontractors and other parties requesting files shall submit Electronic Media Files Agreement.

#### 1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within five days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 30 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Responsibilities and personnel assignments.
    - b. Tentative construction schedule.
    - c. Phasing.
    - d. Critical work sequencing and long lead items.
    - e. Designation of key personnel and their duties.
      - 1) Identify individuals and their duties and responsibilities; list company, addresses, cellular telephone numbers, and e-mail addresses. Provide

names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

- f. Lines of communications.
  - g. Use of web-based Project software.
  - h. Procedures for processing field decisions and Change Orders.
  - i. Procedures for RFIs.
  - j. Procedures for testing and inspecting.
  - k. Procedures for processing Applications for Payment.
  - l. Distribution of the Contract Documents.
  - m. Submittal procedures.
  - n. Preparation of Record Documents.
  - o. Use of the premises.
  - p. Work restrictions.
  - q. Working hours.
  - r. Owner's occupancy requirements.
  - s. Responsibility for temporary facilities and controls.
  - t. Procedures for moisture and mold control.
  - u. Procedures for disruptions and shutdowns.
  - v. Construction waste management and recycling.
  - w. Parking availability.
  - x. Office, work, and storage areas.
  - y. Equipment deliveries and priorities.
  - z. First aid.
  - aa. Security.
  - bb. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
- 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
  - a. Contract Documents.
  - b. Options.
  - c. Related RFIs.
  - d. Related Change Orders.
  - e. Purchases.
  - f. Deliveries.
  - g. Submittals.
  - h. Review of mockups if applicable.
  - i. Possible conflicts.
  - j. Compatibility requirements.
  - k. Time schedules.
  - l. Weather limitations.
  - m. Manufacturer's written instructions.
  - n. Warranty requirements.
  - o. Compatibility of materials.
  - p. Acceptability of substrates.
  - q. Temporary facilities and controls.
  - r. Space and access limitations.
  - s. Regulations of authorities having jurisdiction.

- t. Testing and inspecting requirements.
  - u. Installation procedures.
  - v. Coordination with other work.
  - w. Required performance results.
  - x. Protection of adjacent work.
  - y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at bi-weekly intervals.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site use.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.
      - 10) Quality and work standards.
      - 11) Status of correction of deficient items.
      - 12) Field observations.
      - 13) Status of RFIs.
      - 14) Status of Proposal Requests.
      - 15) Pending changes.
      - 16) Status of Change Orders.
      - 17) Pending claims and disputes.
      - 18) Documentation of information for payment requests.
  3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
    - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

## SECTION 01 33 00 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Submittal schedule requirements.
  - 2. Administrative and procedural requirements for submittals.
  
- B. Related Requirements:
  - 1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
  - 3. Section 01 77 00 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
  - 4. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.

#### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
  
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

#### 1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
  - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  - 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
  - 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
  - 4. Format: Arrange the following information in a tabular format:
    - a. Scheduled date for first submittal.
    - b. Specification Section number and title.
    - c. Submittal Category: Action; informational.
    - d. Name of subcontractor.
    - e. Description of the Work covered.
    - f. Scheduled date for Architect's final release or approval.



- g. Scheduled dates for purchasing.
- h. Scheduled date of fabrication.
- i. Scheduled dates for installation.
- j. Activity or event number.
- k. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of the need to review submittals concurrently for coordination.
- l. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

#### 1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
  - 1. Project name.
  - 2. Date.
  - 3. Name of Architect.
  - 4. Name of Contractor.
  - 5. Name of firm or entity that prepared submittal.
  - 6. Names of subcontractor, manufacturer, and supplier.
  - 7. Unique submittal number, including revision identifier.
  - 8. Category and type of submittal.
  - 9. Submittal purpose and description.
  - 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
  - 11. Drawing number and detail references, as appropriate.
  - 12. Indication of full or partial submittal.
  - 13. Location(s) where product is to be installed, as appropriate.
  - 14. Other necessary identification.
  - 15. Remarks.
  - 16. Signature of transmitter. Include Contractor's certification stating that information submitted complies with the Requirements of the Contract Documents.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number. Submit via Project management software.

#### 1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
    - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier. Include Specification Section number with sequential alphanumeric identifier an 'r' and numerical suffix for resubmittals. (ie 013300-01r1)
  3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.
- 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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect'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 subsequent submittals is required. Architect 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's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- E. 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 marked with approval notation from Architect's action stamp.
- F. 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.
- G. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## 1.6 SUBMITTAL REQUIREMENTS

- A. 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 published data are unsuitable 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 catalog cuts.
    - c. Manufacturer's product specifications.
    - d. Standard color charts.
    - e. Statement of compliance with specified referenced standards.
    - f. Testing by recognized testing agency.
    - g. Application of testing agency labels and seals.
    - h. Notation of coordination requirements.
    - i. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed vs. field installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- B. 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 unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
  2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
  4. 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.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
  6. 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 will retain two Sample sets; remainder will be returned.
      - 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.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit a 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. Provide a notarized signature where indicated.
  2. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
  3. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
  4. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
1. Compatibility Test Reports: Submit 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 substrate preparation and primers required.
2. Field Test Reports: Submit written reports 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.
  3. Material Test Reports: Submit 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.
  4. Preconstruction Test Reports: Submit 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.
  5. Product Test Reports: Submit written reports indicating that 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.
  6. Research Reports: Submit 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:
    - a. Name of evaluation organization.
    - b. Date of evaluation.
    - c. Time period when report is in effect.
    - d. Product and manufacturers' names.
    - e. Description of product.
    - f. Test procedures and results.
    - g. Limitations of use.

#### 1.7 DELEGATED-DESIGN SERVICES

- 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 insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and one paper copy of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  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.

#### 1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect .
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.
  1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

## 1.9 ARCHITECT'S REVIEW

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- F. Architect will return without review submittals received from sources other than Contractor.
- G. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 00

## SECTION 01 40 00 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual 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 Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

- H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect .

### 1.3 DELEGATED DESIGN SERVICES

- 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.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.\
- C. Design professional to be registered in the state which the Project is being constructed in.

### 1.4 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
  - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.



- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.
  - 4. Identification of applicable standards.
  - 5. Identification of test and inspection methods.
  - 6. Number of tests and inspections required.
  - 7. Time schedule or time span for tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

#### 1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 15 days of Notice of Award , and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
  - 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.7 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, telephone number, and email address of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, telephone number, and email address of technical 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 of whether conditions, products, and installation will affect warranty.
  - 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, telephone number, and email address of factory-authorized service representative making report.
  - 2. Statement that equipment complies with requirements.
  - 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  - 4. Statement of whether conditions, products, and installation will affect warranty.
  - 5. Other required items indicated in individual Specification Sections.

## 1.8 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
  - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. **Testing and Inspecting Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
  - 1. Provide test specimens representative of proposed products and construction.
  - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
  - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
  - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
  - 5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
  - 6. **Testing Agency Responsibilities:** Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

- K. Specialty Mockups: See Section 01 43 39 "Mockups" for additional construction requirements for **[integrated exterior mockups] [preconstruction laboratory mockups] [and] [room mockups]**.

## 1.9 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor .
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Engage a qualified testing agency to perform quality-control services.
    - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

- F. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
  
- G. **Contractor's Associated Requirements and Services:** Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspection equipment at Project site.
  
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
  
- I. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
  - 1. **Schedule Contents:** Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
  - 2. **Distribution:** Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 TEST AND INSPECTION LOG

- A. **Test and Inspection Log:** Prepare a record of tests and inspections. Include the following:
  - 1. Date test or inspection was conducted.
  - 2. Description of the Work tested or inspected.
  - 3. Date test or inspection results were transmitted to Architect.
  - 4. Identification of testing agency or special inspector conducting test or inspection.
  
- B. **Maintain log at Project site.** Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
  - 1. Submit log at Project closeout as part of Project Record Documents.

### 3.2 REPAIR AND PROTECTION

- A. **General:** On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

## SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

#### 1.2 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use with metering. Provide connections and extensions of services and metering as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use with metering. Provide connections and extensions of services and metering as required for construction operations.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, timesteps, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
  - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
  - 3. Indicate methods to be used to avoid trapping water in finished work.

- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
1. Locations of dust-control partitions at each phase of work.
  2. HVAC system isolation schematic drawing.
  3. Location of proposed air-filtration system discharge.
  4. Waste-handling procedures.
  5. Other dust-control measures.
- G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
1. Methods used to meet the goals and requirements of the Owner.
  2. Concrete cutting method(s) to be used.
  3. Location of construction devices on the site.
  4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
  5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
  6. Indicate locations of sensitive **[research] [patient] [equipment] <Insert item>** areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

#### 1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

#### 1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.



- C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- E. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

## 2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
  - 3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 4. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## PART 3 - EXECUTION

### 3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

### 3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 1. Locate facilities to limit site disturbance as specified in Section 01 10 00 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
  - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
    - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
    - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
  - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
  - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

### 3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
  - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

- E. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

### 3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
  1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
  2. Utilize designated area within existing building for temporary field offices.
  3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
  1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
  1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 31 20 00 "Earth Moving."
  3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
  4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 32 12 16 "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
  2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- F. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  2. Remove snow and ice as required to minimize accumulations.

- H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 "Execution."
- I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

### 3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
  - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Section 01 10 00 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 31 10 00 "Site Clearing."
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.
  - 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
  - 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
  - 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
  - 4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Comply with requirements specified in Section 01 56 39 "Temporary Tree and Plant Protection."
- G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

- I. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- L. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- M. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
  - 1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
  - 2. Paint and maintain appearance of walkway for duration of the Work.
- N. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

### 3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
  - 1. Protect porous materials from water damage.
  - 2. Protect stored and installed material from flowing or standing water.
  - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
  - 4. Remove standing water from decks.
  - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
  - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  - 2. Keep interior spaces reasonably clean and protected from water damage.
  - 3. Periodically collect and remove waste containing cellulose or other organic matter.
  - 4. Discard or replace water-damaged material.
  - 5. Do not install material that is wet.
  - 6. Discard and replace stored or installed material that begins to grow mold.

7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    - a. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00

## SECTION 01 60 00 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 01 10 00 "Summary" for Contractor requirements related to Owner-furnished products.
  - 2. Section 01 21 00 "Allowances" for products selected under an allowance.
  - 3. Section 01 23 00 "Alternates" for products selected under an alternate.
  - 4. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
  - 5. Section 01 42 00 "References" for applicable industry standards for products specified.
  - 6. Section 01770 "Closeout Procedures" for submitting warranties.

#### 1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
  - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
  - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that

does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
  - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
  - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 33 00 "Submittal Procedures."
- F. Substitution: Refer to Section 01 25 00 "Substitution Procedures" for definition and limitations on substitutions.

### 1.3 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - 1. Resolution of Compatibility Disputes between Multiple Contractors:
    - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
    - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
  - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
  - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
    - a. Name of product and manufacturer.
    - b. Model and serial number.
    - c. Capacity.
    - d. Speed.
    - e. Ratings.
  - 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

### 1.4 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.



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

## 1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. **Manufacturer's Warranty:** Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
  2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. **Special Warranties:** Prepare a written document that contains appropriate terms and identification, ready for execution.
1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
  2. **Specified Form:** When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. **Submittal Time:** Comply with requirements in Section 01 77 00 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
    - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
  2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
  3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
    - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
  4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
    - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
  5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
    - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
    - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
    - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
  7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
    - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
  3. Evidence that proposed product provides specified warranty.
  4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
  5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 33 00 "Submittal Procedures."
1. Form of Approval of Submittal: As specified in Section 01 33 00 "Submittal Procedures."
  2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

## SECTION 01 73 00 - EXECUTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
  - 8. Correction of the Work.

#### 1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

#### 1.3 PREINSTALLATION MEETINGS

- A. Layout Conference: Conduct conference at Project site.
  - 1. Prior to establishing layout of new perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
    - a. Contractor's superintendent.
    - b. responsible for performing Project surveying and layout.
  - 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
  - 3. Review requirements for including layouts on Shop Drawings and other submittals.
  - 4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Final Property Survey: Submit 1 electronic copies showing the Work performed and record survey data.

#### 1.5 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    - a. Primary operational systems and equipment.
    - b. Fire separation assemblies.
    - c. Air or smoke barriers.
    - d. Fire-suppression systems.
    - e. Plumbing piping systems.
    - f. Mechanical systems piping and ducts.
    - g. Control systems.
    - h. Communication systems.
    - i. Fire-detection and -alarm systems.
    - j. Conveying systems.
    - k. Electrical wiring systems.
    - l. Operating systems of special construction.
  3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    - a. Water, moisture, or vapor barriers.
    - b. Membranes and flashings.
    - c. Exterior curtain-wall construction.
    - d. Sprayed fire-resistive material.
    - e. Equipment supports.
    - f. Piping, ductwork, vessels, and equipment.
    - g. Noise- and vibration-control elements and systems.
  4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
  1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
  2. List of detrimental conditions, including substrates.
  3. List of unacceptable installation tolerances.
  4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 01 31 00 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect .

### 3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect . Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two **<Insert number>** permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.



2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Final Property Survey: Engage a to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor , that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb, and make horizontal work level.
  2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  2. Allow for building movement, including thermal expansion and contraction.
  3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

### 3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 01 10 00 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

- a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
  - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

### 3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.

- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

## SECTION 01 77 00 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
- B. Related Requirements:
  - 1. Section 01 29 00 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
  - 2. Section 01 78 23 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
  - 3. Section 01 78 39 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 4. Section 01 79 00 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

#### 1.2 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

## 1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
  5. Submit testing, adjusting, and balancing records.
  6. Submit sustainable design submittals not previously submitted.
  7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
  6. Advise Owner of changeover in utility services.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements.
  10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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

#### 1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, provide items identified on Final Completion Checklist included in project manual.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.8 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
  2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Contractor.
    - d. Page number.
  4. Submit list of incomplete items in on of the following format:
    - a. PDF Electronic File: Architect will return annotated file.

#### 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  1. Submit by uploading to web-based project software site.
- E. Warranties in Paper Form:
  1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.



2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
    - i. Vacuum and mop concrete.
    - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - l. Remove labels that are not permanent.

- m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- r. Clean strainers.
- s. Leave Project clean and ready for occupancy.

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 01 73 00 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 01 77 00

## SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

#### 1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
  - 1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.
  - 2. For Final Manual Submittal, Submit three paper copies in bound manuals to Owner.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

## 1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
  4. Supplementary Prepared on 8-1/2-by-11-inch white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.

4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
  2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
  3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

## 1.7 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.

6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

## 1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.

4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

## 1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.

4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of maintenance manuals.
- 1.10 PRODUCT MAINTENANCE MANUALS
- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
1. Product name and model number.
  2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.



5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 23

## SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
  - 2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
      - 2) Submit Record Digital Data Files and one set(s) of plots.
      - 3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

#### 1.3 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether

- individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
  - b. Accurately record information in an acceptable drawing technique.
  - c. Record data as soon as possible after obtaining it.
  - d. Record and check the markup before enclosing concealed installations.
  - e. Cross-reference record prints to corresponding photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect . When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
  2. Format: DWG , Version 2018
  3. Format: Annotated PDF electronic file.
  4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  5. Refer instances of uncertainty to Architect for resolution.
  6. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
    - a. See Section 01 31 00 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

4. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT RECORD DRAWINGS."
  - d. Name of Architect .
  - e. Name of Contractor.

#### 1.4 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

#### 1.5 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders , Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF or electronic file scanned PDF electronic file(s) of marked-up paper copy of Product Data.
  1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

#### 1.6 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
  1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

## 1.7 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 39

## SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Form-facing material for cast-in-place concrete.
  - 2. Shoring, bracing, and anchoring.
- B. Related Requirements:
  - 1. Section 32 13 13 "Concrete Paving" for formwork related to concrete pavement and walks.

#### 1.3 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each of the following:
  - 1. Exposed surface form-facing material.
  - 2. Concealed surface form-facing material.
  - 3. Form ties.
  - 4. Form-release agent.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
  - 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
  - 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

- a. For architectural concrete specified in Section 03 33 00 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

## 2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
  1. Provide continuous, true, and smooth concrete surfaces.
  2. Furnish in largest practicable sizes to minimize number of joints.
  3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete, and as follows:
    - a. Plywood, metal, or other approved panel materials.
- B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
  1. Provide lumber dressed on at least two edges and one side for tight fit.

## 2.3 RELATED MATERIALS

- A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- B. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
  1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
  2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- D. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
  3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete" for as-cast finishes .
- C. Limit concrete surface irregularities as follows:
  1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
  1. Minimize joints.
  2. Exposed Concrete: Symmetrically align joints in forms.

- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
  - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
  - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
  - 1. Provide and secure units to support screed strips
  - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
  - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
  - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
  - 1. Determine sizes and locations from trades providing such items.
  - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
  - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
  - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 3. Place joints perpendicular to main reinforcement.
  - 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
    - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
  - 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
  - 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.



### 3.2 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
  - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
  - 3. Clean embedded items immediately prior to concrete placement.

### 3.3 REMOVING AND REUSING FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
  - 1. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work.
  - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
  - 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
  - 1. Align and secure joints to avoid offsets.
  - 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
  - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

END OF SECTION 03 10 00

## SECTION 03 20 00 - CONCRETE REINFORCING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Steel reinforcement bars.
  - 2. Welded-wire reinforcement.
- B. Related Requirements:
  - 1. Section 32 13 13 "Concrete Paving" for reinforcing related to concrete pavement and walks.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Each type of steel reinforcement.
  - 2. Bar supports.
  - 3. Mechanical splice couplers.
- B. Shop Drawings: Comply with ACI SP-066:
  - 1. Include placing drawings that detail fabrication, bending, and placement.
  - 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
  - 1. Location of construction joints is subject to approval of Architect.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
  - 1. Store reinforcement to avoid contact with earth.
  - 2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
  - 3. Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
  - 4. Do not allow stainless steel reinforcement to come into contact with uncoated reinforcement.

### PART 2 - PRODUCTS

#### 2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 , deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
  - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
    - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- C. Mechanical Splice Couplers: ACI 318 Type 1 , same material of reinforcing bar being spliced; tension-compression type .
- D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
  - 1. Finish: Plain .

## 2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:
  - 1. Do not cut or puncture vapor retarder.
  - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

### 3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
  - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
  - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
  - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
  - 2. Stagger splices in accordance with ACI 318.
  - 3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.

- G. Install welded-wire reinforcement in longest practicable lengths.
  - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
    - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
  - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
  - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
  - 4. Lace overlaps with wire.

### 3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement.
  - 2. Continue reinforcement across construction joints unless otherwise indicated.
  - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

### 3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
  - 1. Steel-reinforcement placement.
  - 2. Steel-reinforcement mechanical splice couplers.

END OF SECTION 03 20 00

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

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
  - 1. Section 03 10 00 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
  - 2. Section 03 20 00 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
  - 3. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-ground.
  - 4. Section 32 13 13 "Concrete Paving" for concrete pavement and walks.

#### 1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each of the following.
  - 1. Portland cement.
  - 2. Fly ash.
  - 3. Slag cement.
  - 4. Aggregates.
  - 5. Admixtures:
    - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
  - 6. Vapor retarders.
  - 7. Liquid floor treatments.
  - 8. Joint fillers.
- B. Design Mixtures: For each concrete mixture, include the following:
  - 1. Mixture identification.
  - 2. Minimum 28-day compressive strength.
  - 3. Durability exposure class.
  - 4. Maximum w/cm.
  - 5. Slump limit.
  - 6. Air content.
  - 7. Nominal maximum aggregate size.
  - 8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
  - 9. Intended placement method.
  - 10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Bonding agents.
  - 4. Adhesives.
  - 5. Vapor retarders.
  - 6. Semirigid joint filler.
  - 7. Joint-filler strips.
  
- B. Material Test Reports: For the following, from a qualified testing agency:
  - 1. Portland cement.
  - 2. Fly ash.
  - 3. Slag cement.
  - 4. Aggregates.
  - 5. Admixtures:
    - a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.
  
- C. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

#### 1.5 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
  - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
  
- B. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
  
- C. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

#### 1.7 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
  - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 3. Do not use frozen materials or materials containing ice or snow.
  - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
  - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
  - 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

### 2.2 CONCRETE MATERIALS

- A. Cementitious Materials:
  - 1. Portland Cement: ASTM C150/C150M, Type I , gray .
  - 2. Fly Ash: ASTM C618, Class C or F.
  - 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C260/C260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
  - 2. Retarding Admixture: ASTM C494/C494M, Type B.
  - 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
  - 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- E. Water and Water Used to Make Ice: ASTM C94/C94M, potable

### 2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class C: ASTM E1745, Class C ; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

### 2.4 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide W. R. Meadows, Inc; Liqui-Hard or comparable product by one of the following:
    - a. Dayton Superior Corporation.
    - b. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
    - c. Laticrete International, Inc.
    - d. MAPEI Corporation.
    - e. PROSOCO, Inc.

## 2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

## 2.6 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
  - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
  - 2. Slag Cement: 50 percent by mass.
  - 3. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
  - 4. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
  - 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs concrete for parking structure slabs, and concrete with a w/cm below 0.50.

## 2.7 CONCRETE MIXTURES

- A. Class : Normal-weight concrete used for footings, grade beams, and tie beams.
  - 1. Exposure Class: ACI 318 F2 W1 C1 .
  - 2. Minimum Compressive Strength: 4000 psi at 28 days.
  - 3. Maximum w/cm: 0.40 .
  - 4. Slump Limit: 4 inches , plus or minus 1 inch .
  - 5. Air Content:
    - a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size .
  - 6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- B. Class B : Normal-weight concrete used for foundation walls.
  - 1. Exposure Class: ACI 318 F2 W1 C1 .
  - 2. Minimum Compressive Strength: 4000 psi at 28 days.
  - 3. Maximum w/cm: 0.50 .
  - 4. Slump Limit: 4 inches , plus or minus 1 inch .
  - 5. Air Content:
    - a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size .
  - 6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- C. Class C : Normal-weight concrete used for interior slabs-on-ground.



1. Exposure Class: ACI 318 F3 W1 C2.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.50 .
4. Minimum Cementitious Materials Content: 520 lb/cu. yd. .
5. Slump Limit: 4 inches , plus or minus 1 inch .
6. Air Content:
  - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
7. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

## 2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions:
  1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
  2. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
  1. Daily access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
  4. Security and protection for test samples and for testing and inspection equipment at Project site.

### 3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
  1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

### 3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
  1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
  2. Face laps away from exposed direction of concrete pour.
  3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
  4. Lap joints 6 inches and seal with manufacturer's recommended tape.

5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
  6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
  7. Protect vapor retarder during placement of reinforcement and concrete.
    - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

### 3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
  2. Place joints perpendicular to main reinforcement.
    - a. Continue reinforcement across construction joints unless otherwise indicated.
    - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
  3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  4. Space vertical joints in walls . Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
  2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
  2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
  2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
1. If a section cannot be placed continuously, provide construction joints as indicated.
  2. Deposit concrete to avoid segregation.
  3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
    - a. Do not use vibrators to transport concrete inside forms.
    - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Do not place concrete floors and slabs in a checkerboard sequence.
  2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  3. Maintain reinforcement in position on chairs during concrete placement.
  4. Scream slab surfaces with a straightedge and strike off to correct elevations.
  5. Level concrete, cut high areas, and fill low areas.
  6. Slope surfaces uniformly to drains where required.
  7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
  8. Do not further disturb slab surfaces before starting finishing operations.

### 3.7 FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes:
1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
    - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.

- b. Remove projections larger than 1 inch.
- c. Tie holes do not require patching.
- d. Surface Tolerance: ACI 117 Class D.
- e. Apply to concrete surfaces not exposed to public view .

B. Related Unformed Surfaces:

- 1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
- 2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish:

- 1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
- 2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
- 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
- 4. Do not add water to concrete surface.
- 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
- 6. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
  - a. Slabs on Ground:
    - 1) Specified overall values of flatness,  $F_F$  35; and of levelness,  $F_L$  25; with minimum local values of flatness,  $F_F$  24; and of levelness,  $F_L$  17.

### 3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

- 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
- 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
- 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

### 3.10 TOLERANCES

A. Conform to ACI 117.

### 3.11 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

- 1. Defer joint filling until concrete has aged at least **[one] [six]** month(s).
- 2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

### 3.12 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
  - 1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
  - 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
  - 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
      - 1) Project name.
      - 2) Name of testing agency.
      - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
      - 4) Name of concrete manufacturer.
      - 5) Date and time of inspection, sampling, and field testing.
      - 6) Date and time of concrete placement.
      - 7) Location in Work of concrete represented by samples.
      - 8) Date and time sample was obtained.
      - 9) Truck and batch ticket numbers.
      - 10) Design compressive strength at 28 days.
      - 11) Concrete mixture designation, proportions, and materials.
      - 12) Field test results.
      - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
      - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
  - 1. Verification of use of required design mixture.
  - 2. Concrete placement, including conveying and depositing.
  - 3. Curing procedures and maintenance of curing temperature.
  - 4. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
  - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

- a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
  - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; .
  - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M:
  - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
  - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31/C31M:
  - a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
  - a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
  - b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests:
  - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
  - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
    - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

### 3.13 PROTECTION

- A. Protect concrete surfaces as follows:
  1. Protect from petroleum stains.
  2. Diaper hydraulic equipment used over concrete surfaces.
  3. Prohibit use of pipe-cutting machinery over concrete surfaces.
  4. Prohibit placement of steel items on concrete surfaces.
  5. Prohibit use of acids or acidic detergents over concrete surfaces.

6. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
7. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 30 00

## SECTION 08 36 13 - SECTIONAL DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes
  - 1. Electrically operated steel sectional doors.
  - 2. Electric Door operators

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type and size of sectional door and accessory.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
  - 4. Operation and maintenance data.
  - 5. Nameplate data and ratings for motors.
- B. Shop Drawings: For each installation include:
  - 1. Plans, elevations, sections, and mounting details.
  - 2. Details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Points of attachment and their corresponding static and dynamic loads imposed on structure.
  - 4. Diagrams for power, signal, and control wiring.
- C. Samples for Verification: For each type of exposed finish in manufacturer's standard sizes.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Manufacturer.
- B. Sample Warranties: For special warranties.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sectional doors to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who approved by manufacturer for both installation and maintenance of units required for this Project, with a minimum of five years of documented experience.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of doors specified in this section, with not less than ten years of documented experience.
- C. Regulatory Requirements: Comply with applicable provisions in ICC A117.1.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.



1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Faulty operation of hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
    - d. Delamination of exterior or interior facing materials.
  2. Warranty Period: 8 years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain sectional doors from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
1. Design Wind Load: As indicated on Drawings.
  2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
    - a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
    - b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.

### 2.3 DOOR ASSEMBLIES

- A. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Clopay Building Products, Premium Duty 2-inches door Model 3724 or comparable product by one of the following
    - a. Overhead Door Corporation.
    - b. Raynor.
    - c. Wayne-Dalton Corp.
  2. Style: Steel doors with minor ribs, thermally-broken, polyurethane insulated.
  3. Overall Panel Thickness: 2-inches.
  4. Steel Skin Thickness: Minimum 27 gauge 0.020 inch exterior; minimum 28 gauge 0.015 inch interior.
  5. End Stiles: Galvanized steel end stiles, engineered for easy hardware attachment through pre-punched holes. Minimum 18 gauge, 0.045 inch thick for single end hinge style and 16 gauge .056 inch minimum for double end hinge style.
  6. Astragal: U-shaped flexible PVC in retainer of full-length 0.055 inch rigid PVC.
  7. Thermal Resistance (R-value): 17.4 deg F hr sq ft/Btu; calculated door section R-value in accordance with DASMA TDS-163.
  8. Finish: Interior stucco embossed texture with shallow U ribbed pattern, white interior color. Exterior stucco embossed with ribbed pattern, exterior as follows:
    - a. Clopay ColorBlast, a two part paint system utilizing Sherwin Williams Solar reflective Polane Paint system. Paint system shall meet or exceed AAMA 2604 standards.
    - b. Color: as selected by Architect from Manufacturer's standard colors.
  9. Locking: Inside spring loaded slide bolt lock on end stile that engages slot in track.
    - a. Provide one inside slide lock.

10. Weatherstripping: Provide complete perimeter seals. Provide flexible top seal, flexible jamb seal and U shaped bottom seal.
11. Track:
  - a. 3 inches track designed for 3" diameter rollers. Vertical and horizontal tracks minimum 0.096 inch galvanized steel.
  - b. Provide track configuration to maximize headroom available per plans
12. Spring Counterbalance: Torsion spring counterbalance mechanism sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of die cast aluminum with high strength galvanized aircraft cable with minimum 7 to 1 safety factor.
  - a. Maximum Cycles on a single shaft line.
13. Bar Sensor: Miller Edge, ME110
14. Door Construction:
  - a. Style: Steel doors with minor ribs, thermally-broken, polyurethane insulated.
  - b. Panels: Foamed in place Polyurethane core construction between exterior and interior steel skins.
  - c. Steel Skins: Formed from roll formed commercial or drawing quality steel sheet, hot-dip galvanized per ASTM A 924/A 924M and ASTM A 653/A 653M, pre-painted with primer and baked-on polyester topcoat; sections formed to create weather tight tongue-in-groove meeting joint.
  - d. Reinforcing: Galvanized and primed steel reinforcement located under each hinge location, pre-punched for hinge attachment.
  - e. Handle: Step plate/lift handle on bottom panel section.

#### 2.4 ELECTRIC DOOR OPERATORS FOR STEEL DOORS

- A. General: Provide electric door operator provided by door manufacturer for door with operational life specified complete with electric motor and factory pre-wired motor controls, starter, gear-reduction unit, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation. Comply with NFPA 70.
- B. Disconnect Device: Provide hand-operated disconnect or mechanism for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- C. Design operator so motor may be removed without disturbing limit switch adjustment and without affecting emergency auxiliary operator.
- D. Provide control equipment complying with NEMA ICS1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, AC or DC.
  1. Radio Receiver: On-board, 3-channel receiver with standard external antenna; equipped to accept Rolling Code Technology remote controls and trinary DIP switch remote controls, with memory up to (30) 3-button remote controls (or 90 single-button remote controls) plus 30 wireless keypads, or an unlimited number of trinary DIP switch remote controls. Tri-band frequency (310/315/390 MHz) sends multiple radio signals to bypass radio interference.
- E. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motor, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps (0.2 m/s) and not more than 1 fps (.03m/s), without exceeding nameplate ratings or considering service factor.
  1. Type: Solid State.
  2. Type: Jackshaft.
  3. HP:
    - a. 1 hp (746 W).

4. Power Characteristics:
    - a. 480 V, 3 phase
  5. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
- F. Remote Control Station: Provide continuous contact, 3-button control station with push - button controls labeled "Open", "Close" and "Stop".
- G. Provide auxiliary chain hoist: for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged. (Doors less than 15' wide)

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Tracks:
  1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
  2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
- C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

#### 3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.
- D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 08 36 13

## SECTION 08 91 19 - FIXED LOUVERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Combination Louver/Damper, Drainable Blade.

#### 1.2 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing in accordance with AMCA 500-L.
- F. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing in accordance with AMCA 540.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
  - 1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
  - 2. Show mullion profiles and locations.

#### 1.4 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

#### 1.5 WARRANTY

- A. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures are considered to act normal to the face of the building.
  1. Wind Loads:
    - a. Determine loads based on pressures as indicated on Drawings.
- B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

### 2.2 FIXED EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal Drainable-Blade Louver, Extruded Aluminum :
  1. Basis-of-Design Product: Subject to compliance with requirements, provide Greenheck, ECD-601 or comparable product by one of the following:
    - a. Architectural Louvers Co.; Harray, LLC.
    - b. Construction Specialties, Inc.
    - c. Ruskin; Air Distribution Technologies, Inc.; Johnson Controls, Inc.
  2. Louver Depth: 6 inches .
  3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
  4. Mullion Type: Exposed.
  5. Provide with integral damper. Include 120V actuator.
  6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

### 2.3 MATERIALS

- A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
  1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
  2. For fastening aluminum, use aluminum or 300 series stainless steel fasteners.
  3. For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless steel fasteners.
  4. For fastening stainless steel, use 300 series stainless steel fasteners.
  5. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless steel components, with allowable load or strength design capacities calculated in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing in accordance with ASTM E488/E488M conducted by a qualified testing agency.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

## 2.4 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
  - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated .
- C. Maintain equal louver blade spacing , including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
  - 1. Frame Type: Channel unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
  - 1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
  - 2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades, so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
  - 3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
- G. Provide subsills made of same material as louvers or extended sills for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

## 2.5 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.
  - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions .
  - 2. Color and Gloss: As selected by Architect from manufacturer's full range .

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

### 3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

### 3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19



## SECTION 09 67 23 - RESINOUS FLOORING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes resinous flooring systems.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 12 inches square, applied to a rigid backing by Installer for this Project.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Installer to include a list of projects completed using the same system or comparable for reference.
- C. Material Certificates: For each resinous flooring component, from manufacturer.
- D. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer and has at least 5 years of experience with work of similar scope and quality. Installer shall provide a list of past projects with work of similar scope and quality.
- B. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- C. Preinstallation Conference: Conduct conference at Project site.
  1. Review manufacturer's written instructions for substrate preparation and environment conditions affecting resinous flooring installation.
  2. Review manufacturer's written instructions for installing resinous flooring system.
  3. Review protection measures for adjacent construction and installed flooring, curbs, base details and so forth.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store materials per product data sheet.
- C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Flammability: Self-extinguishing according to ASTM D 635.

### 2.2 MANUFACTURERS

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

### 2.3 RESINOUS FLOORING (RF-1)

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
- B. Basis of Design Product: Subject to compliance with requirements, provide Stonhard, Inc; products indicated or a comparable product by one of the following:
  - 1. Key Resin Company.
  - 2. Tennant Company.
  - 3. Elite Crete Systems.
- C. System Characteristics:
  - 1. Color and Pattern: As selected from Manufacturer's standard colors
  - 2. Wearing Surface: Medium texture for slip resistance.
  - 3. Integral Cove Base: None
  - 4. Overall System Thickness: nominal 1/4"

- D. System Components: Manufacturer's standard components that are compatible with each other and as follows:
1. Primer:
    - a. Basis of Design: Stonhard Standard Primer
    - b. Resin: Epoxy
    - c. Formulation Description: (2) two component, 100 percent solids.
    - d. Application method: Squeegee and roller.
    - e. Number of Coats (1) one.
  2. Mortar Base:
    - a. Basis of Design: Stonclad GS
    - b. Resin: Epoxy.
    - c. Formulation Description: (3) three component 100 percent solids.
    - d. Application Method: Metal Trowel.
      - 1) Thickness of Coats: nominal 1/4" inch.
      - 2) Number of Coats: One.
    - e. Aggregates: Pigmented Blended aggregate.
  3. Top Coat:
    - a. Basis of Design: Stonkote GS4
    - b. Resin: Epoxy.
    - c. Formulation Description: (2) two component 100 percent solids.
    - d. Type: Pigmented.
    - e. Finishes: Provide aggregate for added texture, final selection to be reviewed with physical samples.
- E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Compressive Strength: 7,700 psi after 7 days per ASTM C 579.
  2. Tensile Strength: 1,000 psi per ASTM C 307.
  3. Water Absorption: < 1 % per ASTM C 413.
  4. Flexural Strength: 4,000 psi per ASTM C 580.
  5. Flexural Modules of Elasticity:  $2.6 \times 10^6$  psi per ASTM C-580
  6. Hardness: .85 to .90, Shore D per ASTM D 2240.
  7. Thermal Coefficient of Linear Expansion:  $1.3 \times 10^{-5}$  in./in. .F per ASTM C-531
  8. Flammability: Class 1 per ASEM E-648
- F. Performance Requirements
1. Floor Slip Resistance: Products and installation shall result in a static coefficient of friction according to ASTM C 1028 as follows:
    - a. Level Floor Surface: Minimum 0.6
- G. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.
- H. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:
    - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    - b. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
    - c. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
  2. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
    - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 6 lb of water/1000 sq. ft. of slab area in 24 hours.
    - b. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement.
  3. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
  2. Patch to be applied with trowel to cracks and holes. Large cracks should be chased with an angle grinder to allow for patch.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

### 3.2 APPLICATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
  2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
  3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

### 3.3 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
  2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
  3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.4 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 23

## SECTION 09 91 00 - PAINTING

### PART 1 - PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes materials for Painting.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
  - 1. Submit 8-1/2 x 11 color downs on heavy paper to match Architect's color chips for each color and type of paint specified for Architect's approval.
    - a. Architect will furnish a schedule after beginning of construction. The schedule will include color chips for matching.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. Material Certificates: For scrub resistance and washability, signed by manufacturers.

#### 1.3 QUALITY ASSURANCE

- A. Architect has the option of requesting test patches in place for Architect's approval of final color and finish.
  - 1. Notify Architect 48 hours in advance of the time the test patches will be ready for inspection.
- B. Manufacturer shall certify that tests have been performed on semi-gloss wall finish and others as selected by the Architect. Acceptance of materials is conditional upon demonstration of washability and abrasion resistance of test patches. Testing shall include the following:
  - 1. Scrub resistance per ASTM D2486-79: Value as specified in approved finish schedule but not less than 1200.
  - 2. Washability per ASTM D3450-80: Value as specified in approved finish schedule but not less than 80% for sponge and 90% for brush.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.
    - a. Do not store oil or paint soaked rags inside the building.
  - 3. Do not store materials in any room containing a direct-fired heating unit.
- B. Mix and thin paints in strict accordance with recommendations of the manufacturer.
  - 1. Mix paints only in areas designated, and provided proper protection for walls and floors.

## 1.5 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply interior paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

## PART 2 - PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce manufacturer and product lists, the following requirements apply for product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

### 2.3 COLORS

- A. The Architect has the option of accenting certain building elements different colors; (i.e.: doors, frames, columns, ceilings, walls) to be defined in a Schedule.
- B. The Architect reserves the right to select colors from manufacturer's standard or premium price groups, including deep tone colors for both interior and exterior products.
- C. Furnish an equal product by the same manufacturer only in those instances where a deep tone color specified by the Architect is not available in the specified product. This is subject to Architect's approval.
- D. Tinted primer shall be used whenever deep tone colors are specified.

### 2.4 EXTERIOR FINISHES

- A. Ferrous Metals (i.e. doors, railings, fences, lintels, etc.):
  - 1. First Coat: (If flash rusting occurs, use two coats)
    - a. Benjamin Moore: Ultra Spec HP Acrylic Metal Primer HP04
    - b. PPG PAINTS: Pitt-Tech Plus Interior/Exterior Industrial Primer 4020PF series.
    - c. Pratt & Lambert: Universal Acrylic Primer Z6631 or Steeltech Acrylic Prime & Finish Z190.
    - d. Sherwin Williams: Pro Industrial Pro Cryl Universal Acrylic Primer B66-01310 Series
  - 2. Second and Third Coats:
    - a. Benjamin Moore: Ultra Spec HP DTM Acrylic Gloss Enamel HP28

- b. PPG PAINTS: Pitt Tech Plus DTM Acrylic Gloss, 90-1310 series.
- c. Pratt & Lambert: DTM Acrylic Gloss Z6841 or Semi-Gloss Z6761 or Satin Z6671.
- d. Sherwin Williams: Pro Industrial DTM Acrylic Gloss B66W01051 Series except at railings which shall receive Pro Industrial Waterbased Acrolon 100 Urethane Gloss, B65-700 Series

## 2.5 INTERIOR FINISHES

- A. Structural Steel, Interior Exposed:
  - 1. For warranty purposes, the Contractor shall insure that the specified primer in Division 5 "Structural Steel" and the intermediate and finish coats specified below are from the same manufacturer.
    - a. No coatings shall be applied until approved by the Architect and Owner's Representative.
  - 2. Prime Coat: Refer to Division 5, "Structural Steel."
    - a. Benjamin Moore: Corotech 100% Solids Epoxy Pre-Primer V155
  - 3. Intermediate Coat:
    - a. Tnemec: One (1) coat TNEMEC Series 161 Tneme-fascure @ 4.0 to 6.0 mil DFT.
    - b. PPG PAINTS: (1) COAT Pitt Guard DTR Epoxy Mastic.
    - c. Wasser: One (1) component MC-CR @ 3.0-4.0 mils DFT.
    - d. Sherwin Williams: One (1) coat Macropoxy 646 FC, B58 Series @ 5-10 mils DFT.
    - e. Benjamin Moore: Corotech Waterborne Amine Epoxy V440
  - 4. Finish Coat:
    - a. Tnemec: One (1) coat TNEMEC Series 74 Endura-Shield @ 2.0 to 5.0 mil DFT.
    - b. PPG PAINTS: Pitthane Ultra Aliphatic Urethane Enamel, 95-812 @ 2.0 to 3.0 mils DFT.
    - c. Wasser: One (1) component MC-Luster @ 2.0-4.0 mils DFT.
    - d. Sherwin Williams: One (1) coat Acrolon 218 HS Acrylic Polyurethane, B65 Series @ 3-6 mils DFT.
    - e. Benjamin Moore: Corotech Waterborne Amine Epoxy V440

## PART 3 - PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION OF NEW SUBSTRATES

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.



2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Ferrous Metals, Galvanized Metal, Aluminum: Clean surfaces according to the Steel Structure Painting Council Surface Preparation Specifications: SSPC-SP1 Solvent Cleaning, SSPC-SP2 Hand Tool Cleaning, or SSPC-SP3 Power Tool Cleaning, as appropriate.
1. Steel Substrates: Remove any rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
  2. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
    - a. Thoroughly clean galvanized metal per SSPC-SP1 with water soluble degreaser. No hydrocarbons.
  3. Aluminum Substrates: Remove surface oxidation.

### 3.3 APPLICATION

- A. General: Apply paints according to manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
    - a. Except where specifically authorized by the Architect to do otherwise: Apply flat or eggshell wall paint by brush or roller; apply gloss or semi-gloss with brush only.
  2. Sanding: In addition to preparatory sanding, fine sand between succeeding coats of all varnish enamel or flat enamel, using sandpaper appropriate to the finish. Use fine production paper between coats.
  3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  5. Doors: Finish all edges, including tops and bottoms, of wood and metal doors same as faces. Fill edges of exposed plywood doors, panels, similar materials.
  6. Finish interior of all closets and cabinets same as adjoining rooms, unless otherwise scheduled.
  7. Apply one coat of sanding sealer and one coat of semi-gloss varnish to insides of all drawers unless otherwise specified.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. The number of coats scheduled are minimums.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
1. Holidays and restrikes in painted surfaces shall be considered sufficient cause to require recoating of entire surface.

### 3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
  - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
  - 2. Testing agency will perform tests for compliance of paint materials with product requirements.
  - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 09 91 00

## SECTION 13 34 19 - METAL BUILDING SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Structural-steel framing.
  - 2. Metal roof panels.
  - 3. Metal wall panels.
  - 4. Personnel doors and frames.
  - 5. Windows in Metal Building System.
  - 6. Accessories.
- B. Related Requirements:
  - 1. Section 08 36 13 "Sectional Doors" for sectional vehicular doors in metal building systems.
  - 2. Section 08 91 19 "Fixed Louvers" for Louvers in metal building systems.

#### 1.2 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

#### 1.3 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."
- B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .
  - 1. Review methods and procedures related to metal building systems including, but not limited to, the following:
    - a. Condition of foundations and other preparatory work performed by other trades.
    - b. Structural load limitations.
    - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
    - d. Required tests, inspections, and certifications.
    - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.
  - 2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
    - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
    - b. Structural limitations of purlins and rafters during and after roofing.
    - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
    - d. Temporary protection requirements for metal roof panel assembly during and after installation.

- e. Roof observation and repair after metal roof panel installation.
- 3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
  - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
  - b. Structural limitations of girts and columns during and after wall panel installation.
  - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
  - d. Temporary protection requirements for metal wall panel assembly during and after installation.
  - e. Wall observation and repair after metal wall panel installation.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Metal roof panels.
    - b. Metal wall panels.
    - c. Personnel doors and frames.
    - d. Windows.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:
  - 1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
    - a. Anchor-Rod Plans shall include acceptable types and sizes for cast-in-place as well as post-installed anchors.
  - 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
    - a. Show provisions for attaching roof curbs , hanging equipment and overhead doors, and pipe racks.
  - 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
    - a. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.
  - 4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches :
    - a. Flashing and trim.
    - b. Gutters.
    - c. Downspouts.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For the following products:
  - 1. Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
  - 2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
  - 3. Accessories: Nominal 12-inch- long Samples for each type of accessory.

- E. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.
  - 1. Door Hardware Schedule: Include details of fabrication and assembly of door hardware. Organize schedule into door hardware sets indicating complete designations of every item required for each door or opening.
  - 2. Keying Schedule: Detail Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- F. Delegated-Design Submittal: For metal building systems.
  - 1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For erector manufacturer .
- B. Letter of Design Certification: Signed and sealed by a registered professional engineer in the State of Michigan. Include the following:
  - 1. Name and location of Project.
  - 2. Order number.
  - 3. Name of manufacturer.
  - 4. Name of Contractor.
  - 5. Building dimensions including width, length, height, and roof slope.
  - 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
  - 7. Governing building code and year of edition.
  - 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
  - 9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
  - 10. Building-Use Category: Indicate category of building use and its effect on load importance factors.
- C. Sample Warranties: For special warranties.
- D. Submit certification verifying that the metal standing seam roof system has been tested in accordance with ASTM E 1592 test protocols.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

## 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
  - 1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
  - 2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

## 1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

## 1.11 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 25 years from date of Substantial Completion.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Nucor Corporation, Nucor Buildings Group; or comparable product by one of the following:
  - 1. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
  - 2. Ceco Building Systems; an NCI company.
  - 3. Varco-Pruden Buildings; a division of BlueScope Buildings North America, Inc.
  - 4. American Buildings, A Nucor Brand.
- B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

## 2.2 SYSTEM DESCRIPTION

- A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
- B. Primary-Frame Type:
  - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns .
- D. Secondary-Frame Type: Manufacturer's standard purlins and exterior-framed (bypass) girts.
- E. Eave Height: As indicated on the Drawings .
- F. Bay Spacing: As determined by manufacturer .
- G. Roof Slope: As indicated on the Drawings .
- H. Roof System: Manufacturer's standard standing-seam, vertical-rib, metal roof panels.
- I. Exterior Wall System: Manufacturer's standard exposed-fastener, tapered-rib, metal wall panels.

## 2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design metal building system.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
  - 1. Design Loads: As indicated on Drawings .
  - 2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
  - 3. Deflection and Drift Limits: No greater than the following:
    - a. Purlins: Vertical deflection of 1/150 of the span.
    - b. Rafters/Frames: Vertical deflection of 1/180 of the span.
    - c. Girts: Horizontal deflection of 1/180 of the span.
    - d. Metal Roof Panels: Vertical deflection of 1/180 of the span.
    - e. Metal Wall Panels: Horizontal deflection of 1/180 of the span.
    - f. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
    - g. Lateral Drift: Maximum of 1/60 of the building height in the direction parallel to the primary frames at the Storage Garage when subjected to 10-yr MRI wind loads.
    - h. Lateral Drift: Maximum of 1/120 of the building height in the direction perpendicular to the primary frames at the Storage Garage when subjected to 10-yr MRI wind loads.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint

sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F , ambient; 180 deg F , material surfaces .

D. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.

E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

## 2.4 STRUCTURAL-STEEL FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted, except where shown on the Drawings.

3. Exterior Column: Uniform depth or Tapered per delegated design preference.

4. Rafter: Uniform depth or Tapered per delegated design preference.

E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.

2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- wide flanges.

a. Depth: As needed to comply with system performance requirements .

2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- wide flanges.

a. Depth: As required to comply with system performance requirements .



3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
  4. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch- diameter, cold-formed structural tubing to stiffen primary-frame flanges.
  5. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
  6. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch , fabricated from zinc-coated (galvanized) steel sheet.
  7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
  8. Framing for Openings: Channel shapes; fabricated from cold-formed, structural steel sheet or structural steel shapes; Frame head and jamb of door openings and head, jamb, and sill of other openings.
  9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- G. Bracing: Provide adjustable wind bracing as follows:
1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 ; or ASTM A 529/A 529M, Grade 50 ; minimum 1/2-inch- diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
  2. Cable: ASTM A 475, minimum 1/4-inch- diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
- H. Materials:
1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55 ; or ASTM A 529/A 529M, Grade 50 or 55 .
  2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 ; or ASTM A 529/A 529M, Grade 50 or 55 .
  3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 ; or ASTM A 529/A 529M, Grade 50 or 55 .
  4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
  5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
  6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55 , or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70 ; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80 , or HSLAS, Grades 45 through 70 .
  7. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
    - a. Finish: Plain .
  8. High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M, Grade A325 , Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers.
    - a. Finish: Plain .
  9. Unheaded Anchor Rods: ASTM F 1554, Grade 36 .
    - a. Configuration: Straight.
    - b. Nuts: ASTM A 563 heavy-hex carbon steel.
    - c. Plate Washers: ASTM A 36/A 36M carbon steel.
    - d. Washers: ASTM F 436 hardened carbon steel.
    - e. Finish: Hot-dip zinc coating, ASTM F 2329, Class C .
  10. Threaded Rods: ASTM A 36/A 36M .
    - a. Nuts: ASTM A 563 heavy-hex carbon steel.
    - b. Washers: ASTM F 436 hardened ASTM A 36/A 36M carbon steel.
    - c. Finish: Plain .

- I. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
  - 1. Clean and prepare in accordance with SSPC-SP2.
  - 2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil .
    - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.
- J. Finish: Field painted. Apply secondary and final paint in field of exposed steel in all buildings.

## 2.5 METAL ROOF PANELS

- A. Standing-Seam, Trapezoidal-Rib, Metal Roof Panels : Formed with raised trapezoidal ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
  - 1. Product: Nucor CFR Standing Seam Roof System
  - 2. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.0222-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
    - a. Exterior Finish: Two-coat fluoropolymer .
    - b. Color: As selected by Architect from manufacturer's full range .
  - 3. Clips: Two-piece floating to accommodate thermal movement.
  - 4. Joint Type: Mechanically seamed.
  - 5. Panel Coverage: 24 inches .
  - 6. Panel Height: 3 inches .
  - 7. Uplift Rating: UL 60 .
- B. Finishes:
  - 1. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil .

## 2.6 METAL WALL PANELS

- A. Exposed-Fastener, Tapered-Rib, Metal Wall Panels : Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
  - 1. Product: Nucor Classic Wall Panel
  - 2. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
    - a. Exterior Finish: Two-coat fluoropolymer .
    - b. Color: As selected by Architect from manufacturer's full range .
  - 3. Major-Rib Spacing: 12 inches o.c.
  - 4. Panel Coverage: 36 inches .
  - 5. Panel Height: 1.25 inches .
- B. Finishes:
  - 1. Exposed Coil-Coated Finish:

- a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil .

## 2.7 PERSONNEL DOORS AND FRAMES

- A. Swinging Personnel Doors and Frames: Metal building system manufacturer's standard doors and frames; prepared and reinforced at strike and at hinges to receive factory- and field-applied hardware according to BHMA A156 Series.
  1. Steel Doors: 1-3/4 inches thick; fabricated from metallic-coated steel face sheets, 0.036-inch nominal uncoated steel thickness, of seamless, hollow-metal construction; with 0.060-inch nominal uncoated steel thickness, inverted metallic-coated steel channels welded to face sheets at top and bottom of door.
    - a. Design: As indicated on Drawings .
    - b. Core: Kraft honeycomb with U-factor rating of at least 0.47 Btu/sq. ft. x h x deg F .
  2. Steel Frames: Fabricate 2-inch- wide face frames from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.060-inch nominal uncoated steel thickness.
    - a. Type: Factory welded.
  3. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold- or hot-rolled steel sheet.
  4. Hardware:
    - a. Provide hardware for each door leaf, as follows:
      - 1) Hinges: BHMA A156.1. Three plain -bearing, standard-weight, full-mortise, stainless-steel or bronze, template-type hinges; 4-1/2 by 4-1/2 inches , with nonremovable pin.
      - 2) Lockset: BHMA A156.2. Mortise, with lever handle type.
      - 3) Exit Device: BHMA A156.3. Touch- or push-bar type.
      - 4) Threshold: BHMA A156.21. Extruded aluminum.
      - 5) Silencers: Pneumatic rubber; three silencers on strike jambs of single door frames and two silencers on heads of double door frames.
      - 6) Closer: BHMA A156.4. Surface-applied, standard-duty hydraulic type.
      - 7) Weather Stripping: Vinyl applied to head and jambs, with vinyl sweep at sill.
  5. Anchors and Accessories: Manufacturer's standard units, galvanized according to ASTM A 123/A 123M.
  6. Fabrication: Fabricate doors and frames to be rigid; neat in appearance; and free from defects, warp, or buckle. Provide continuous welds on exposed joints; grind, dress, and make welds smooth, flush, and invisible.
- B. Materials:
  1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
  2. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B; free of scale, pitting, or surface defects; pickled and oiled.
  3. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, CS, Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.
- C. Finishes for Personnel Doors and Frames:
  1. Prime Finish: Factory-apply manufacturer's standard primer immediately after cleaning and pretreating.
    - a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer

manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2. Field paint second and third coat, color as selected by Owner.

## 2.8 WINDOWS

- A. Aluminum Windows: Metal building system manufacturer's standard window with extruded aluminum frame, with self-flashing mounting fins, and as follows:
  1. Glazing: 3/4 inch insulated glass
  2. Fasteners, Anchors, and Clips: Nonmagnetic stainless steel, aluminum, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.
    - a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.
- B. Finish:
  1. Baked-Enamel Finish, Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 0.7 mil, medium gloss.
    - a. Color: Match adjacent metal panel finish.

## 2.9 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
  1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
  1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
  2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
  3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
  4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where necessary to ensure weathertight construction.
  6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers,

closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
  4. Thermal Spacer Blocks: Where metal panels attach directly to girts, provide thermal spacer blocks of manufacturer's standard thickness, fabricated from extruded polystyrene.
- D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
  2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
1. Gutter Supports: Fabricated from same material and finish as gutters.
  2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- H. Materials:
1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
    - a. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
    - b. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head , with EPDM sealing washers bearing on weather side of metal panels.
    - c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
    - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
  2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
4. Metal Panel Sealants:
  - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
  - b. Joint Sealant: ASTM C 920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

## 2.10 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
  1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
  2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
  1. Make shop connections by welding or by using high-strength bolts.
  2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
  3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
  4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
  5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
  1. Make shop connections by welding or by using non-high-strength bolts.
  2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
  1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
  - 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

### 3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
    - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
  - G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
    1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
    2. Locate and space wall girts to suit openings such as doors and windows.
    3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
  - H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
    1. Tighten rod and cable bracing to avoid sag.
    2. Locate interior end-bay bracing only where indicated.
  - I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
  - J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.
- 3.4 METAL PANEL INSTALLATION, GENERAL

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
  1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- C. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
    - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
  2. Install metal panels perpendicular to structural supports unless otherwise indicated.
  3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Locate metal panel splices over structural supports with end laps in alignment.
  6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- D. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
  1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.



- E. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
  - 1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
  - 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

### 3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
  - 1. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
  - 1. Install clips to supports with self-drilling or self-tapping fasteners.
  - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  - 3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
  - 4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Pre-drill panels for fasteners.
- C. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.
  - 1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
  - 2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
  - 3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
  - 4. At metal panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- E. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated.

Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet , noncumulative; level, plumb, and on location lines; and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.7 DOOR AND FRAME INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

B. Personnel Doors and Frames: Install doors and frames according to NAAMM-HMMA 840. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

1. Between Doors and Frames at Jambs and Head: 1/8 inch .
2. Between Edges of Pairs of Doors: 1/8 inch .
3. At Door Sills with Threshold: 3/8 inch .
4. At Door Sills without Threshold: 3/4 inch .

C. Door Hardware:

1. Install surface-mounted items after finishes have been completed at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
4. Set thresholds for exterior doors in full bed of sealant complying with requirements for concealed mastics specified in Section 07 92 00 "Joint Sealants."

### 3.8 WINDOW INSTALLATION

- A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.
  - 1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Set sill members in bed of sealant or with gaskets, for weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Mount screens directly to frames with tapped screw clips.

### 3.9 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  - 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
  - 1. Provide elbows at base of downspouts to direct water away from building.

2. Tie downspouts to underground drainage system indicated.

- E. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- F. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

### 3.10 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Product will be considered defective if it does not pass tests and inspections.

### 3.11 ADJUSTING

- A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.
- B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.
- C. Windows: Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and at weather stripping to ensure smooth operation and weathertight closure. Lubricate hardware and moving parts.

### 3.12 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."
- D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
  - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.
  - 1. Immediately before final inspection, remove protective wrappings from doors and frames.
- F. Windows: Clean metal surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Clean factory-glazed glass immediately after installing windows.

END OF SECTION 13 34 19

## SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Testing, Adjusting, and Balancing of Air Systems:
    - a. Constant-volume air systems.

#### 1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.
- G. UFAD: Underfloor air distribution.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Certified TAB reports.

#### 1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications, Certified by NEBB :
  - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB .
  - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB .
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."
- D. Code and AHJ Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

## 1.6 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for HVAC to verify that they are properly separated from adjacent areas and sealed.
- F. Examine equipment performance data, including fan curves.
  - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
  - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

- K. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainer baskets are installed and clean.
- L. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Examine control dampers for proper installation for their intended function of isolating, throttling, diverting, or mixing air flows.
- Q. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### 3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
  1. Equipment and systems to be tested.
  2. Strategies and step-by-step procedures for balancing the systems.
  3. Instrumentation to be used.
  4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
  1. Airside:
    - a. Duct systems are complete with terminals installed.
    - b. Volume, smoke, and fire dampers are open and functional.
    - c. Fans are operating, free of vibration, and rotating in correct direction.
    - d. Variable-frequency controllers' startup is complete and safeties are verified.
    - e. Automatic temperature-control systems are operational.
    - f. Windows and doors are installed.
    - g. Suitable access to balancing devices and equipment is provided.

### 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system in accordance with the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.
  1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 23 33 00 "Air Duct Accessories."
  3. Where holes for probes are required in piping or hydronic equipment, install pressure and temperature test plugs to seal systems.

- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.4 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

- A. Test, adjust, and balance HVAC equipment indicated on Drawings, including, but not limited to, the following:
  1. Fans and ventilators.

### 3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' Record drawings duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.

### 3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  1. Measure total airflow.
    - a. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.
    - b. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
  2. Measure fan static pressures as follows:
    - a. Measure static pressure directly at the fan outlet or through the flexible connection.
    - b. Measure static pressure directly at the fan inlet or through the flexible connection.
  3. Review Contractor-prepared shop drawings and Record drawings to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling,



full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

- B. Adjust air inlets and outlets for each space to indicated airflows.
  - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
  - 2. Measure inlets and outlets airflow.
  - 3. Adjust each inlet and outlet for specified airflow.
  - 4. Re-measure each inlet and outlet after they have been adjusted.
  
- C. Verify final system conditions.
  - 1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
  - 2. Re-measure and confirm that total airflow is within design.
  - 3. Re-measure all final fan operating data, speed, volts, amps, and static profile.
  - 4. Mark all final settings.
  - 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
  - 6. Measure and record all operating data.
  - 7. Record final fan-performance data.

### 3.7 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
  - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent . If design value is less than 100 cfm, within 10 cfm.
  - 2. Air Outlets and Inlets: Plus or minus 10 percent **<Insert value>**. If design value is less than 100 cfm, within 10 cfm.
  
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

### 3.8 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
  - 2. Include a list of instruments used for procedures, along with proof of calibration.
  - 3. Certify validity and accuracy of field data.
  
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Fan curves.
  - 2. Manufacturers' test data.
  - 3. Field test reports prepared by system and equipment installers.
  - 4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
  
- C. General Report Data: In addition to form titles and entries, include the following data:
  - 1. Title page.
  - 2. Name and address of the TAB specialist.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB supervisor who certifies the report.

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  11. Summary of contents, including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  12. Nomenclature sheets for each item of equipment.
  13. Data for terminal units, including manufacturer's name, type, size, and fittings.
  14. Notes to explain why certain final data in the body of reports vary from indicated values.
  15. Test conditions for fans performance forms, including the following:
    - a. Other system operating conditions that affect performance.
- D. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
  2. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan speed.
    - d. Discharge static pressure in inches wg.
    - e. Suction static pressure in inches wg.
- E. Instrument Calibration Reports:
1. Report Data:
    - a. Instrument type and make.
    - b. Serial number.
    - c. Application.
    - d. Dates of use.
    - e. Dates of calibration.

### 3.9 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect .
- B. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to the lesser of either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day .
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If recheck measurements find the number of failed measurements noncompliant with requirements indicated, proceed as follows:
  1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. All changes shall be tracked to show changes made to previous report.

2. If the second final inspection also fails, Owner may pursue others Contract options to complete TAB work.

E. Prepare test and inspection reports.

END OF SECTION 23 05 93

## SECTION 23 09 23.16 - GAS INSTRUMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Carbon monoxide monitoring system, multipoint air sampling.

#### 1.2 DEFINITIONS

- A. NDIR: Nondispersive infrared.

#### 1.3 ACTION SUBMITTALS

- A. Product Data:
  - 1. Carbon monoxide monitoring system, multipoint air-sampling.

### PART 2 - PRODUCTS

#### 2.1 CARBON MONOXIDE AND NITROGEN DIOXIDE SENSORS AND TRANSMITTERS

- A. Carbon Monoxide Sensors and Transmitters, Wall Mounted:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Building Automation Products Inc.; BAPI.
    - b. Dwyer Instruments, Inc.
    - c. Honeywell Analytics; Honeywell International, Inc.
    - d. Johnson Controls, Inc.
    - e. MSA Safety, Inc.
    - f. Veris Industries.
  - 2. Source Limitations: Provide carbon monoxide sensors and transmitters, wall mounted, from single manufacturer.
  - 3. Description: Electrochemical measurement technology or equivalent technology that provides performance indicated, long-term stability, and reliability.
    - a. Individual Sensor/Transmitter Applications: Each sensor/transmitter connected directly to DDC system.
    - b. Multiple Sensor/Transmitters for Zoned Applications: Multiple sensor/transmitters arranged in zones as indicated on Drawings and directly connected to carbon monoxide monitoring system controller; furnished with sensors and transmitters as part of a complete system furnished by single manufacturer.
  - 4. Performance:
    - a. Carbon Monoxide Concentration Range: Zero to 100 ppm.
    - b. NO2 Range: Zero to 75 ppm
    - c. Accuracy: Within 5 percent of full-scale range.
    - d. Repeatability: Within 1 percent of full scale.
    - e. Long-Term Stability: Within 5 percent of full scale after more than 5 years.
    - f. Response Time: Within 30 seconds.
    - g. Warm-up Time: Within 1 minute(s).
    - h. Ambient Temperature: Minus 4 to plus 122 deg F .
  - 5. Sensor and Transmitter Output Signals:
    - a. Analog Output Signal: 4 to 20 mA or zero to 10 V dc .
    - b. Digital Output Signal: SPDT .
  - 6. Sensor and Transmitter Serial Communication: BACnet MS/TP .
  - 7. Sensor and Transmitter Construction:

- a. Enclosure: Painted metal or plastic; equivalent to NEMA 250, Type 1 .
  - b. Electrical Connections: Screw terminals.
  - c. Visual Display: Equip with digital display for continuous indication of carbon dioxide concentration only where indicated on Drawings.
8. Carbon Monoxide / Nitrogen Dioxide System Controller:
- a. Configuration:
    - 1) Quantity of Sensors Connected to Each Controller: See Drawings.
    - 2) Arrangement and Quantity of Zones per Controller: See Drawings.
  - b. Signals:
    - 1) Sensor Signal to Controller: Analog or BACnet MS/TP .
    - 2) Controller Output Signal: Digital signal, through control relays, for each sensor connected to controller to indicated alarm status, .
  - c. Enclosure: Painted metal or plastic; equivalent to NEMA 250, Type 1 .
  - d. Electrical Connections: Screw terminals.
  - e. Operator Interface: Keypad or touch sensitive digital display, located on front of enclosure; access protected by password.
  - f. Visual Display: Multiple lines, backlit LCD.
  - g. Alarms:
    - 1) Audible Alarm: Audible alarm with local silence reset; 80 db .
    - 2) Visual Alarms: Faults or failures, individual sensor readings in alarm.
9. Calibration Kit: Provide kit and turn over to Owner at start of warranty period.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for instruments to verify actual locations of connections before installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Furnish and install products required to satisfy more stringent of all requirements indicated.
- B. Install products level, plumb, parallel, and perpendicular with building construction.
- C. Fastening Hardware:
  - 1. Wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
  - 2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by using excessive force or oversized wrenches.
  - 3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.
- D. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

### 3.3 INSTRUMENTS, GENERAL INSTALLATION REQUIREMENTS

- A. Mounting Location:
  - 1. Mount duct-mounted instruments at locations indicated on Drawings.

2. Mount wall-mounted instruments in user-occupied space at locations indicated on Drawings.
  3. Mount instruments intended for wall-mounting using floor-supported freestanding pipe stands, or floor-supported structural support frames where direct-to-wall mounting is not possible. Use manufacturer's mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.
- B. Mounting Height:
1. Mount instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height is to comply with codes and accessibility requirements.
  2. Mount instruments located in mechanical equipment rooms and other similar space not subject to code, state, and federal accessibility requirements within a range of 42 to 72 inches above the adjacent floor, grade, or service catwalk or platform.
    - a. Make every effort to mount at 60 inches.
- C. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static-pressure class and leakage and seal classes indicated, using neoprene gaskets or grommets.
- 3.4 INSTALLATION OF CARBON MONOXIDE MONITORING SYSTEM, MULTIPOINT AIR SAMPLING
- A. If not indicated on Drawings, locate carbon monoxide monitoring system in a secured and serviceable location accessible to authorized personnel.
  - B. Support carbon monoxide monitoring system enclosure from floor or wall. Support floor-mounted systems using a structural channel frame. Provide mounting brackets.
- 3.5 ELECTRICAL CONNECTIONS
- A. Furnish and install electrical power to products requiring electrical connections.
  - B. Furnish and install power wiring. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
  - C. Ground equipment in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."
  - D. Furnish and install raceways. Comply with requirements in Section 26 05 33.13 "Conduits for Electrical Systems" and Section 26 05 33.16 "Boxes and Covers for Electrical Systems."
  - E. Furnish and install circuit breakers. Comply with requirements in Section 26 28 16 "Enclosed Switches and Circuit Breakers."
  - F. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.
  - G. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
    1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 26 05 53 "Identification for Electrical Systems."
    2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

### 3.6 CONTROL CONNECTIONS

- A. Install control signal wiring to field-mounted control devices.
- B. Connect control signal wiring in accordance with Section 26 05 23 "Control-Voltage Electrical Power Cables."
- C. Furnish and install raceways. Comply with requirements in Section 26 05 33.13 "Conduits for Electrical Systems" and Section 26 05 33.16 "Boxes and Covers for Electrical Systems."

### 3.7 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing is to have same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

### 3.8 CLEANING

- A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

### 3.9 CHECKOUT PROCEDURES

- A. Check out installed products before continuity tests, leak tests, and calibration.
- B. Check instruments for proper location and accessibility.
- C. Check instruments for proper installation that impacts performance.
- D. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material, and support.

### 3.10 ADJUSTMENT, CALIBRATION, AND TESTING

- A. Description:
  1. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
  2. Provide written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
  3. For each analog instrument, perform a three-point calibration test for both linearity and accuracy.
  4. Equipment and procedures used for calibration are to comply with instrument manufacturer's written instructions.
  5. Provide diagnostic and test equipment for calibration and adjustment.
  6. Field instruments and equipment used to test and calibrate installed instruments are to have an accuracy of at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent is to be checked by an instrument with an accuracy of 0.5 percent.
  7. Calibrate each instrument in accordance with instrument instruction manual supplied by manufacturer.
  8. If, after calibration, indicated performance cannot be achieved, replace out-of-tolerance instruments.
  9. Comply with field-testing requirements and procedures in ASHRAE's Guideline 11, in the absence of specific requirements, and to supplement requirements indicated.

- B. Analog Signals:
  - 1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
  - 2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
- C. Digital Signals:
  - 1. Check digital signals using a jumper wire.
  - 2. Check digital signals using an ohmmeter to test for contact.
- D. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.
- E. Transmitters: Check and calibrate transmitters at zero, 50, and 100 percent of Project design values. Field calibration is not required for instruments that have been factory calibrated and provided with certificates.

### 3.11 MAINTENANCE SERVICE

- A. Beginning at Substantial Completion, verify that maintenance service includes three months' full maintenance by manufacturer's authorized service representative. Include annual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Verify that parts and supplies are manufacturer's authorized replacement parts and supplies.

### 3.12 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain instrumentation and control devices.
- B. Coordinate training video with operation and maintenance manuals and classroom instruction for use by Owner in operating, maintaining, and troubleshooting.
- C. Record Owner training and submit digital files with closeout documents for Owner's future use.

END OF SECTION 23 09 23.16



## SECTION 23 34 23 - HVAC POWER VENTILATORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Sidewall propeller fans.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
  - 2. Rated capacities, operating characteristics, and furnished specialties and accessories.
  - 3. Certified fan performance curves with system operating conditions indicated.
  - 4. Certified fan sound-power ratings.
  - 5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 6. Material thickness and finishes, including color charts.
  - 7. Dampers, including housings, linkages, and operators.
  - 8. Prefabricated roof curbs.
  - 9. Fan speed controllers.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of unit components.
- C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

#### 2.2 SIDEWALL PROPELLER FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Acme Engineering & Manufacturing Corp.
  - 2. Greenheck.
  - 3. Loren Cook Company.
- B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring, with baked-enamel finish coat applied after assembly.

- C. Fan Wheels: Formed-steel blades riveted to heavy-gauge steel spider bolted to cast-iron hub.
- D. Fan Wheel: Replaceable, -aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- E. Fan Drive, Direct: Direct-drive motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- F. Accessories:
  - 1. Dampers: Counterbalanced, parallel-blade, backdraft dampers factory set to close when fan stops.
  - 2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
  - 3. Wall Sleeve: Galvanized steel to match fan and accessory size.
  - 4. Weathershield Hood: Galvanized steel to match fan and accessory size.

## 2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors
  - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Install power ventilators level and plumb.
- B. Equipment Mounting:
  - 1. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
  - 2. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13 "Vibration Controls for HVAC."
- C. Install units with clearances for service and maintenance.
- D. Label units according to requirements specified in Section 23 05 53 "Identification for HVAC Piping and Equipment."

### 3.2 DUCTWORK CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

### 3.3 ELECTRICAL CONNECTIONS

- A. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
  - 1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 26 05 53 "Identification for Electrical Systems."

2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

### 3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring according to Section 26 05 23 "Control-Voltage Electrical Power Cables."

### 3.5 STARTUP SERVICE:

- A. Perform startup service.
  1. Complete installation and startup checks in accordance with manufacturer's written instructions.
  2. Verify that shipping, blocking, and bracing are removed.
  3. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
  4. Verify that cleaning and adjusting are complete.
  5. For direct-drive fans, verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.
  6. For belt-drive fans, disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
  7. Adjust damper linkages for proper damper operation.
  8. Verify lubrication for bearings and other moving parts.
  9. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
  10. Disable automatic temperature-control operators, energize motor and confirm proper motor rotation and unit operation, adjust fan to indicated rpm, and measure and record motor voltage and amperage.
  11. Shut unit down and reconnect automatic temperature-control operators.
  12. Remove and replace malfunctioning units and retest as specified above.

### 3.6 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Lubricate bearings.
- C. Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

### 3.7 CLEANING

- A. After completing system installation and testing, adjusting, and balancing and after completing startup service, clean fans internally to remove foreign material and construction dirt and dust.

### 3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION 23 34 23

## SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Copper building wire.
  - 2. Connectors and splices.
- B. Related Requirements:
  - 1. Section 26 05 23 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

#### 1.2 ACTION SUBMITTALS

- A. Product Data:
  - 1. Copper building wire.
  - 2. Connectors and splices.

#### 1.3 INFORMATIONAL SUBMITTALS

### PART 2 - PRODUCTS

#### 2.1 COPPER BUILDING WIRE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alpha Wire; brand of Belden, Inc.
  - 2. Belden Inc.
  - 3. General Cable; Prysmian Group North America.
  - 4. Okonite Company (The).
  - 5. Southwire Company, LLC.
- B. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- E. Conductor Insulation:
  - 1. Type THHN and Type THWN-2. Comply with UL 83.
  - 2. Type XHHW-2. Comply with UL 44.

#### 2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M Electrical Products.
  2. ABB, Electrification Business.
  3. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  4. Hubbell Utility Solutions; Hubbell Incorporated.
  5. ILSCO.
  6. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
- B. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Copper .
  2. Type: One hole with standard barrels.
  3. Termination: Compression .

### PART 3 - EXECUTION

#### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits:
1. Copper:
    - a. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

#### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type XHHW-2, single conductors in raceway .
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type XHHW-2, single conductors in raceway .
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway .
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway .
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway .
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway .

#### 3.3 INSTALLATION, GENERAL

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

- B. Complete raceway installation between conductor and cable termination points in accordance with Section 26 05 33.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

### 3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

### 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

### 3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 13 "Penetration Firestopping."

### 3.8 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
  - 2. Perform each of the following visual and electrical tests:

- a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
- b. Test bolted connections for high resistance using one of the following:
  - 1) A low-resistance ohmmeter.
  - 2) Calibrated torque wrench.
  - 3) Thermographic survey.
- c. Inspect compression-applied connectors for correct cable match and indentation.
- d. Inspect for correct identification.
- e. Inspect cable jacket and condition.
- f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
- g. Continuity test on each conductor and cable.
- h. Uniform resistance of parallel conductors.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

## SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Grounding and bonding conductors.
  2. Grounding and bonding clamps.
  3. Grounding and bonding bushings.
  4. Grounding and bonding hubs.
  5. Grounding and bonding connectors.
  6. Grounding (earthing) electrodes.

#### 1.2 ACTION SUBMITTALS

- A. Shop Drawings: Plans showing dimensioned locations of grounding features described in "Field Quality Control for Grounding and Bonding of Electrical Power" Article, including the following:
1. Grounding electrodes.

#### 1.3 CLOSEOUT SUBMITTALS

### PART 2 - PRODUCTS

#### 2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment Grounding Conductor:
1. General Characteristics: 600 V, THHN/THWN-2 or THWN-2 , copper or tinned-copper wire or cable, green color, in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- B. ASTM - Bare Copper Grounding and Bonding Conductor:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ERICO; brand of nVent Electrical plc.
    - b. Harger Lightning & Grounding; business of Harger, Inc.
  2. Referenced Standards: Complying with one or more of the following:
    - a. Soft or Annealed Copper Wire: ASTM B3.
    - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
    - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
    - d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

#### 2.2 GROUNDING AND BONDING CLAMPS

- A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.
- B. Performance Criteria:
1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.



2. Listing Criteria:
  - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
  - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
  
- C. UL KDER - Beam Grounding and Bonding Clamp :
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ABB, Electrification Business.
    - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  2. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.
  
- D. UL KDER - Exothermically Welded Connection :
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - c. ERICO; brand of nVent Electrical plc.
  2. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## 2.3 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
  
- B. Performance Criteria:
  1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
  
- C. UL KDER - Bonding Bushing :
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - b. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  2. General Characteristics: Threaded bushing with insulated throat.
  
- D. UL KDER - Grounding Bushing :
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Crouse-Hinds; brand of Eaton, Electrical Sector.

- b. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
2. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

## 2.4 GROUNDING AND BONDING HUBS

- A. Description: Hubs with certified grounding or bonding locknut.
- B. Performance Criteria:
- 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- C. UL KDER - Grounding and Bonding Hub :
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - 2. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

## 2.5 GROUNDING AND BONDING CONNECTORS

- A. Performance Criteria:
- 1. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
    - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- B. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector :
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - b. ERICO; brand of nVent Electrical plc.
  - 2. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened.
    - a. Copper Copper alloy Tinned copper.

## 2.6 GROUNDING (EARTHING) ELECTRODES

- A. Performance Criteria:
- 1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria:
    - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- B. UL KDER - Rod Electrode :
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
    - b. ERICO; brand of nVent Electrical plc.
  - 2. General Characteristics: Copper-clad steel ; 3/4 inch by 10 ft .

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

#### 3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

- A. Grounding and Bonding Conductors:
  - 1. Provide solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
  - 2. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
  - 3. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.
  - 4. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
  - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
  - 6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
  - 7. Underground Grounding Conductors: Install bare copper conductor, 2 AWG minimum.
- B. Grounding and Bonding Connectors:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Structural Steel: Welded connectors.

#### 3.3 INSTALLATION OF GROUNDING AND BONDING

- A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Grounding and Bonding Conductors:
  - a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
  - b. Underground Grounding Conductors:
    - 1) Bury at least 30 inch below grade.
2. Grounding and Bonding Connectors: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
  - a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
  - b. Make connections with clean, bare metal at points of contact.
  - c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
  - d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
  - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
  - f. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
    - 1) Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
    - 2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
    - 3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.
  - g. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.
3. Electrodes:
  - a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.
    - 1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
    - 2) Use exothermic welds for below-grade connections.
  - b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.
4. Grounding at Service:
  - a. Equipment grounding conductors and grounding electrode conductors must be connected to ground busbar. Install main bonding jumper between neutral and ground buses.

D. Grounding Separately Derived Systems:

1. Equipment Grounding and Bonding:
  - a. Install insulated equipment grounding conductors with feeders and branch circuits.

#### 3.4 PROTECTION

- A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 26 05 26

## SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. Support, anchorage, and attachment components.

#### 1.2 ACTION SUBMITTALS

#### 1.3 INFORMATIONAL SUBMITTALS

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

#### 2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ABB, Electrification Business.
    - b. Allied Tube & Conduit; Atkore International.
    - c. Cooper B-line; brand of Eaton, Electrical Sector.
    - d. G-Strut.
    - e. Unistrut; Atkore International.
  2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Material for Channel, Fittings, and Accessories: Galvanized steel .
  4. Channel Width: Selected for applicable load criteria .
  5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Conduit and Cable Support Devices: Steel Steel and malleable-iron Stainless steel Glass-fiber-resin hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      - 1) Hilti, Inc.
      - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
  2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1) Cooper B-line; brand of Eaton, Electrical Sector.
  - 2) Hilti, Inc.
  - 3) ITW Ramset/Red Head; Illinois Tool Works, Inc.
- 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
- 5. Hanger Rods: Threaded steel.

## PART 3 - EXECUTION

### 3.1 SELECTION

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  - 1. NECA NEIS 101
- B. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways specified in Section 26 05 33.13 "Conduits for Electrical Systems."
- D. Comply with requirements for boxes specified in Section 26 05 33.16 "Boxes and Covers for Electrical Systems."
- E. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as required by scheduled in NECA NEIS 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size must be 1/4 inch in diameter.
- F. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with single-bolt conduit clamps .

### 3.2 INSTALLATION OF SUPPORTS

- A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT IMC and ERMC may be supported by openings through structure members, in accordance with NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
3. To Existing Concrete: Expansion anchor fasteners.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inch thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch thick.
5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69 Spring-tension clamps.

- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

### 3.4 PAINTING

- A. Touchup:
  1. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
    - a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 26 05 29



## SECTION 26 05 33.13 - CONDUITS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Type ERM-C duct raceways, elbows, couplings, and nipples.
  - 2. Type IMC duct raceways.
  - 3. Type LFMC duct raceways.
  - 4. Type PVC duct raceways and fittings.
  - 5. Fittings for conduit, tubing, and cable.
  - 6. Electrically conductive corrosion-resistant compounds for threaded conduit.
  - 7. Solvent cements.
- B. Products Installed, but Not Furnished, under This Section:
  - 1. See Section 26 05 53 "Identification for Electrical Systems" for electrical equipment labels.

#### 1.2 DEFINITIONS

- A. Conduit: A structure containing one or more duct raceways.
- B. Duct Raceway: A single enclosed raceway for conductors or cable.
- C. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.

#### 1.3 ACTION SUBMITTALS

- A. Product Data:
  - 1. Type ERM-C duct raceways, elbows, couplings, and nipples.
  - 2. Type IMC duct raceways.
  - 3. Type LFMC duct raceways.
  - 4. Type PVC duct raceways and fittings.
  - 5. Fittings for conduit, tubing, and cable.
  - 6. Electrically conductive corrosion-resistant compounds for threaded conduit.
  - 7. Solvent cements.

#### 1.4 INFORMATIONAL SUBMITTALS

### PART 2 - PRODUCTS

#### 2.1 TYPE ERM-C DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN DYIX; including UL 6.
- B. Source Quality Control:
  - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - b. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - c. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    - d. Western Tube; Zekelman Industries.
    - e. Wheatland Tube; Zekelman Industries.
  2. Exterior Coating: Zinc.
  3. Options:
    - a. Interior Coating: Zinc with organic top coating Zinc .
    - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    - c. Colors: As indicated on Drawings.

## 2.2 TYPE IMC DUCT RACEWAYS

- A. Performance Criteria:
1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  2. Listing Criteria: UL CCN DYBY; including UL 1242.
- B. Source Quality Control:
1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
- C. UL DYBY - Steel Intermediate Metal Conduit (IMC):
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Allied Tube & Conduit; Atkore International.
    - b. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    - c. Western Tube; Zekelman Industries.
    - d. Wheatland Tube; Zekelman Industries.
  2. Options:
    - a. Exterior Coating: Zinc .
    - b. Interior Coating: Zinc with organic top coating Zinc .
    - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    - d. Colors: As indicated on Drawings.

## 2.3 TYPE LFMC DUCT RACEWAYS

- A. Performance Criteria:
1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  2. Listing Criteria: UL CCN DXHR; including UL 360.
- B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Anaconda Sealtite; Anamet Electrical, Inc.
  - b. Electri-Flex Company.
2. Material: Steel.
3. Options:
  - a. Minimum Trade Size: Metric designator 16 (trade size 1/2) .
  - b. Colors: As indicated on Drawings.

## 2.4 TYPE PVC DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DZYR; including UL 651.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DZYR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. ABB, Electrification Business.
  - b. Calconduit; Atkore International.
  - c. NAPCO; Westlake Chemical Corp.
2. Dimensional Specifications: Schedule 40.
3. Options:
  - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
  - b. Markings: For use with maximum 90 deg C wire .

## 2.5 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

- C. UL DWTT - Fittings for Type ERMFC, Type IMC, Type PVC, Type HDPE, Type EPEC, and Type RTRC Duct Raceways:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Appleton; Emerson Electric Co., Automation Solutions.
    - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
  - 2. Listing Criteria: UL CCN DWTT; including UL 514B.
  - 3. Options:
    - a. Material: Steel .
    - b. Coupling Method: Compression coupling .
    - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.
  
- D. UL DXAS - Fittings for Type LFMC and Type LFNC Duct Raceways:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Arlington Industries, Inc.
    - b. Liquid Tight Connector Co.
  - 2. Listing Criteria: UL CCN DXAS; including UL 514B.

2.6 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN FOIZ; including UL Subject 2419.
  
- B. Source Quality Control:
  - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
  - 2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
  
- C. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ABB, Electrification Business.

2.7 SOLVENT CEMENTS

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
  - 2. Listing Criteria: UL CCN DWTT; including UL 514B.
  
- B. Source Quality Control:
  - 1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

### PART 3 - EXECUTION

#### 3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
  1. Exposed and Subject to Severe Physical Damage: ERM C IMC.
  2. Exposed and Subject to Physical Damage: ERM C IMC .
    - a. Locations less than 2.5 m (8 ft) above finished floor.
  3. Exposed and Not Subject to Physical Damage: ERM C IMC .
  4. Direct Buried: PVC-40 .
- C. Indoors:
  1. Exposed and Subject to Severe Physical Damage: ERM C IMC. Locations include the following:
    - a. Loading docks.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.
  2. Exposed and Subject to Physical Damage: ERM C IMC . Locations include the following:
    - a. Locations less than 2.5 m (8 ft) above finished floor.
    - b. Stub-ups to above suspended ceilings.
  3. Exposed and Not Subject to Physical Damage: ERM C IMC .
  4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC .
- D. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
  1. ERM C and IMC: Provide threaded-type fittings unless otherwise indicated.

#### 3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  1. Type ERM C-S: Article 344 of NFPA 70 and NECA NEIS 101.
  2. Type IMC: Article 342 of NFPA 70 and NECA NEIS 101.
  3. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
  4. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
  5. Type RTRC: Article 355 of NFPA 70 and NECA NEIS 111.
  6. Expansion Fittings: NEMA FB 2.40.
  7. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
  1. General Requirements for Installation of Duct Raceways:
    - a. Complete duct raceway installation before starting conductor installation.
    - b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.

- c. Install no more than equivalent of three 90-degree bends in conduit run except for control wiring conduits, for which no more than equivalent of two 90-degree fewer bends are permitted. Support within 12 inch of changes in direction.
- d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
- e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- f. Support conduit within 12 inch of enclosures to which attached.
- g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
- h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following points:
  - 1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2) Where an underground service duct raceway enters a building or structure.
  - 3) Conduit extending from interior to exterior of building.
  - 4) Conduit extending into pressurized duct raceway and equipment.
  - 5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  - 6) Where otherwise required by NFPA 70.
- i. Do not install duct raceways or electrical items on "explosion-relief" walls or rotating equipment.
- j. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
- k. Keep duct raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
- l. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
- m. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
- n. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
  - 1) Termination fittings with shoulders do not require two locknuts.
- o. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- 2. Types EMT-A, ERMC-A, and FMC-A: Do not install aluminum duct raceways or fittings in contact with concrete or earth.
- 3. Types ERMC and IMC:
  - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.
- 4. Type ERMC-S-PVC:

- a. Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.
  - b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERMC-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERMC-S-PVC duct raceway.
  - c. Coat field-cut threads on PVC-coated duct raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.
5. Types FMC, LFMC, and LFNC:
    - a. Provide a maximum of 36 inch of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  6. Types PVC, HDPE, and EPEC:
    - a. Do not install Type PVC, Type HDPE, or Type EPEC conduit where ambient temperature exceeds 122 deg F . Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
    - b. Comply with manufacturer's published instructions for solvent welding and fittings.
  7. Duct Raceways Embedded in Slabs:
    - a. Run duct raceways larger than metric designator 27 (trade size 1) below concrete slab Run duct raceways larger than metric designator 27 (trade size 1) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place duct raceway close to slab support. Secure duct raceways to reinforcement at maximum 10 ft intervals.
    - b. Arrange duct raceways to cross building expansion joints with expansion fittings at right angles to the joint.
    - c. Arrange duct raceways to ensure that each is surrounded by minimum of 1 inch of concrete without voids.
    - d. Do not embed threadless fittings in concrete unless locations have been specifically approved by Architect.
    - e. Change from ENT to ERMC or IMC before rising above floor.
  8. Stub-ups to Above Recessed Ceilings:
    - a. Provide EMT, IMC, or ERMC for duct raceways.
    - b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
  9. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:
    - a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG. Install insulated throat metal grounding bushings on service conduits.
  10. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
    - a. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
    - b. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.
  11. Expansion-Joint Fittings:
    - a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground ERMC conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.
    - b. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

- 1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
  - 2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
  - 3) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
  - 4) Attics: 135 deg F temperature change.
- c. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
  - d. Install expansion fittings at locations where conduits cross building or structure expansion joints.
  - e. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
12. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.
    - a. Provide warning signs.
- D. Interfaces with Other Work:
1. Coordinate with Section 26 05 29 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.

### 3.3 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33.13



## SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Type PVC raceways and fittings.
  - 2. Fittings for conduit, tubing, and cable.
  - 3. Solvent cements.
  - 4. Handholes and boxes for exterior underground wiring.

#### 1.2 DEFINITIONS

- A. Duct: A single raceway or multiple raceways, installed singly or as components of a duct bank.
- B. Duct Bank: Two or more ducts installed in parallel, direct buried or with additional casing materials such as concrete.
- C. Handhole: An underground chamber containing electrical cables, sized such that personnel are not required to enter in order to access the cables.
- D. Manhole: An underground chamber containing electrical cables and equipment, sized to provide access with working space clearances.
- E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

#### 1.3 PREINSTALLATION MEETINGS

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For concrete and steel used in precast concrete handholes, also include product certificates as required by ASTM C858.

### PART 2 - PRODUCTS

#### 2.1 TYPE PVC RACEWAYS AND FITTINGS

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - 2. General Characteristics: UL 651 and UL CCN DZYR.
- B. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Calconduit; Atkore International.
    - b. NAPCO; Westlake Chemical Corp.
    - c. Topaz Lighting & Electric.
  - 2. Dimensional Specifications: Schedule 40.
  - 3. Options:
    - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

- b. Markings: For use with maximum 90 deg C wire.

## 2.2 FITTINGS FOR CONDUIT, TUBING, AND CABLE

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- B. Metallic Fittings for Type ERM, Type IMC, Type PVC, Type EPEC, and Type RTRC Raceways:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Appleton; Emerson Electric Co., Automation Solutions.
    - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    - c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
    - d. Southwire Company, LLC.
  - 2. General Characteristics: UL 514B and UL CCN DWTT.
  - 3. Options:
    - a. Material: Steel .
    - b. Coupling Method: Compression coupling .
    - c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
    - d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

## 2.3 SOLVENT CEMENTS

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - 2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.

## 2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - 2. General Characteristics:
    - a. ASTM C858 for design and manufacturing processes.
    - b. SCTE 77.
- B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover:
  - 1. Description: Molded of sand, concrete, and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or combination.
  - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Oldcastle Infrastructure Inc.; CRH Americas.
    - b. Quazite; brand of Hubbell Utility Solutions; Hubbell Incorporated.
  - 3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
  - 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and installed location.
    - a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.

- b. Cover Legend: Molded lettering, "ELECTRIC" .
- 5. Conduit Entrance Provisions: Conduit-terminating fittings must mate with entering ducts for secure, fixed installation in enclosure wall.
- 6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- 7. Duct Entrance Provisions: Duct-terminating fittings must mate with entering duct for secure, fixed installation in enclosure wall.
- 8. Handholes 12 inch wide by 24 inch long and larger must have factory-installed inserts for cable racks and pulling-in irons.
- 9. Options:
  - a. Color: Gray .

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Architect if there is conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.
- C. Clear and grub vegetation to be removed, and protect vegetation to remain in accordance with Section 31 10 00 "Site Clearing." Remove and stockpile topsoil for reapplication in accordance with Section 31 10 00 "Site Clearing."

### 3.2 SELECTION OF UNDERGROUND DUCTS

- A. Duct for Electrical Feeders 600 V and Less: PVC-40 , direct buried unless otherwise indicated.
- B. Duct for Electrical Branch Circuits: PVC-40 , direct buried unless otherwise indicated.

### 3.3 SELECTION OF UNDERGROUND ENCLOSURES

- A. Handholes and Boxes:
  - 1. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
  - 2. Cover design load must not exceed load rating of handhole or box.

### 3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 31 20 00 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Restore area immediately after backfilling is completed or after construction vehicle traffic in immediate area is complete.

- C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 32 92 00 "Turf and Grasses" and Section 32 93 00 "Plants."
- E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures in accordance with "Cutting and Patching" Article in Section 01 73 00 "Execution."

### 3.5 INSTALLATION OF DUCTS AND DUCT BANKS

- A. Reference Standards:
  - 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
  - 2. Consult Architect for resolution of conflicting requirements.
- B. Special Techniques:
  - 1. Where indicated on Drawings, install duct, spacers, and accessories into duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
  - 2. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.
  - 3. Expansion and Deflection Fittings: Install expansion and deflection fitting in each duct in area of disturbed earth adjacent to manhole or handhole.
  - 4. Install expansion fitting near center of straight line duct with calculated expansion of more than 3/4 inch.
  - 5. Curves and Bends:
    - a. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of 48 inch , both horizontally and vertically, at other locations unless otherwise indicated.
    - b. Field bending must be in accordance with NFPA 70 minimum radii requirements, except bends over 45 degrees must be made with minimum radius of 48 inch . Use only equipment specifically designed for material and size involved. Use PVC heating bender for bending PVC conduit.
    - c. Duct must have maximum of 180 degrees of bends between pull points.
  - 6. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane. Couple steel conduits to ducts with adapters designed for this purpose, .
    - a. Install insulated grounding bushings on steel raceway terminations that are less than 12 inch below grade or floor level and do not terminate in hubs.
  - 7. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing duct will not be subject to environmental temperatures above 104 deg F. Where environmental temperatures are calculated to rise above 104 deg F, and anywhere duct crosses above underground steam line, install insulation blankets listed for direct burial to isolate duct bank from steam line to maintain maximum environmental temperature of 104 deg F.
  - 8. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inch o.c. for 5 inch duct, and vary proportionately for other duct sizes.
    - a. Begin change from regular spacing to end-bell spacing 10 ft from end bell, without reducing duct slope and without forming trap in line.

- b. Grout end bells into structure walls from both sides to provide watertight entrances.
9. Duct Terminators for Entrances to Cast-in-Place Manholes and Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inch o.c. for 4 inch duct, and vary proportionately for other duct sizes.
  - a. Begin change from regular spacing to terminator spacing 10 ft from terminator, without reducing duct line slope and without forming trap in line.
10. Building Wall Penetrations: Make transition from underground duct to steel raceway at least 10 ft outside building wall, without reducing duct line slope away from building and without forming trap in line. Use fittings manufactured for transition to steel raceway type installed. Install steel raceway penetrations of building walls as specified in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
11. Install manufactured steel raceway elbows for stub-ups at poles unless otherwise indicated.
  - a. Couple steel elbows to ducts with adapters designed for this purpose, of concrete for minimum of on each side of coupling.
12. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15 psig hydrostatic pressure.
13. Pulling Cord: Install 200 lbf test nylon cord in empty ducts.
14. Direct-Buried Duct and Duct Bank:
  - a. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 31 20 00 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inch in nominal diameter.
  - b. Width: Excavate trench 3 inch wider than duct on each side.
  - c. Depth: Install top of duct at least 36 inch below finished grade unless otherwise indicated.
  - d. Set elevation of top of duct bank below frost line.
  - e. Place minimum 3 inch of sand as bed for duct. Place sand to minimum of 6 inch above top level of duct.
  - f. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
  - g. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
  - h. Install duct with minimum of 3 inch between ducts for like services and 6 inch between power and communications duct.
  - i. Install manufactured steel elbows for stub-ups, at building entrances, and at changes of direction in duct.
    - 1) Couple RNC duct to steel raceway with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete.
  - j. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inch over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 31 20 00 "Earth Moving" for installation of backfill materials.
15. Underground-Line Warning Tape: Bury nonconducting underground line specified in Section 26 05 53 "Identification for Electrical Systems" no less than 12 inch above concrete-encased duct and duct banks and approximately 12 inch below grade. Align

tape parallel to and within 3 inch of centerline of duct bank. Provide additional warning tape for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional tapes 12 inch apart, horizontally across width of ducts.

### 3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

#### A. Special Techniques:

1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
2. Unless otherwise indicated, support units on level bed of crushed stone or gravel, graded from 1/2 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
3. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
4. Install handholes and boxes with bottom below frost line, below grade.
5. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
6. Field cut openings for duct in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
7. Ground handholes and boxes in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."

END OF SECTION 26 05 43

## SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Labels.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

### PART 2 - PRODUCTS

#### 2.1 LABELS

- A. Performance Criteria:
  - 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. UL PGDQ2 - Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Brady Corporation.
    - b. Marking Services Inc.
    - c. Panduit Corp.
- C. UL PGDQ2 - Self-Adhesive Wraparound Labels: Preprinted Write-on, 3 mil thick, polyester vinyl flexible label with acrylic pressure-sensitive adhesive.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Brady Corporation.
    - b. Marking Services Inc.
    - c. Panduit Corp.
  - 2. Self-Lamination: Clear; UV-, weather-, and chemical-resistant; self-laminating, with protective shield over legend. Size labels such that clear shield overlaps entire printed legend.
  - 3. Marker for Labels:
    - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
    - b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

### 3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
  - 1. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.
  
- B. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
  - 1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
  - 2. Colors for 208Y/120 V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  - 3. Colors for 240 V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
  - 4. Colors for 480Y/277 V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  - 5. Color for Neutral (Grounded Conductor): White .
  - 6. Color for Equipment Ground: Bare copper Green .
  - 7. Color for Isolated Ground: Green with two or more yellow stripes.
  
- C. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
  - 1. "EMERGENCY POWER."
  - 2. "POWER."
  - 3. "UPS."
  
- D. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
  
- E. Locations of Underground Lines: Underground-line warning tape for power and lighting.
  
- F. Vaults, Manholes, Handholes, and Pull and Junction Boxes, More Than 1000 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and separate tag with circuit designation.
  
- G. Vaults, Manholes, Handholes, and Pull and Junction Boxes, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels self-adhesive wraparound labels self-adhesive vinyl tape to identify phase.
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
  - 2. Identify system voltage and system or service type with black letters on orange field .
  
- H. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels .
  - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
  - 2. Identify system voltage and system or service type with black letters on orange field .
  
- I. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Label cover plate with the following information, in the order listed:
  - 1. Panelboard designation.



2. Colon or dash.
  3. Branch circuit number.
- J. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- K. Equipment Identification Labels:
1. Black letters on white field.
  2. Indoor Equipment: .
  3. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of engraved, laminated acrylic or melamine label.
    - b. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
    - c. .

### 3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

- A. Signs, labels, and tags required for personnel safety must comply with the following standards:
1. Safety Colors: NEMA Z535.1.
  2. Facility Safety Signs: NEMA Z535.2.
  3. Safety Symbols: NEMA Z535.3.
  4. Product Safety Signs and Labels: NEMA Z535.4.
  5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels .
1. Apply to exterior of door, cover, or other access.

### 3.4 INSTALLATION

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.
- D. Verify identity of item before installing identification products.
- E. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- F. Apply identification devices to surfaces that require finish after completing finish work.
- G. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

- H. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.
- I. Vinyl Wraparound Labels:
  - 1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
  - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.
- J. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.
- K. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

END OF SECTION 26 05 53

## SECTION 26 22 13 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Distribution, dry-type transformers with nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

#### 1.2 ACTION SUBMITTALS

- A. Shop Drawings:
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.
  - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
  - 3. Include diagrams for power, signal, and control wiring.

#### 1.3 INFORMATIONAL SUBMITTALS

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: On receipt, inspect for and note shipping damage to packaging and transformer.
  - 1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.
- B. Storage: Store in warm, dry, and temperature-stable location in original shipping packaging.
- C. Temporary Heating: Apply temporary heat in accordance with manufacturer's published instructions within enclosure of ventilated-type units, throughout periods during which equipment is not energized and when transformer is not in space that is continuously under normal control of temperature and humidity.
- D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eaton.
  - 2. MGM Transformer Company.
  - 3. Siemens Industry, Inc., Energy Management Division.
  - 4. Square D; Schneider Electric USA.

#### 2.2 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60 Hz service.

- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- C. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside transformer enclosure.

## 2.3 DISTRIBUTION TRANSFORMERS

- A. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.
  1. One leg per phase.
  2. Core volume must allow efficient transformer operation at 10 percent above nominal tap voltage.
  3. Grounded to enclosure.
- B. Coils: Continuous windings except for taps.
  1. Coil Material: Aluminum .
  2. Internal Coil Connections: Brazed or pressure type.
  3. Terminal Connections: Bolted.
- C. Encapsulation: Transformers smaller than 30 kVA must have core and coils completely resin encapsulated.
- D. Enclosure: Totally enclosed, nonventilated.
  1. Core and coil must be encapsulated within resin compound using vacuum-pressure impregnation process to seal out moisture and air.
  2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
  3. Wiring Compartment: Sized for conduit entry and wiring installation.
  4. Environmental Protection:
    - a. Indoor: UL 50E, Type 3R .
    - b. Outdoor: UL 50E, .
  5. Finish Color: Gray weather-resistant enamel.
- E. Taps for Transformers 7.5 to 24 kVA: Two 5 percent taps below rated voltage.
- F. Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with maximum of 115 deg C rise above 40 deg C ambient temperature.
- G. Grounding: Provide ground-bar kit or ground bar installed on inside of transformer enclosure.
- H. Neutral: Rated 200 percent of full load current for K-factor-rated transformers.
- I. Wall Brackets: Manufacturer's standard brackets .
- J. Low-Sound-Level Requirements: Maximum sound levels when factory tested in accordance with IEEE C57.12.91, as follows:
  1. 9.00 kVA and Less: 40 dB(A-weighted) .

## 2.4 IDENTIFICATION

- A. Nameplates:
  1. Engraved, laminated-acrylic or melamine plastic signs for distribution transformers, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 26 05 53 "Identification for Electrical Systems."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for transformers.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's published instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- D. Verify that ground connections are in place and requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance must be 5  $\Omega$  at location of transformer.
- E. Environment: Enclosures must be rated for environment in which they are located. Covers for UL 50E, Type 4X enclosures may not cause accessibility problems.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer .
  - 1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.
- B. Secure transformer to concrete base in accordance with manufacturer's published instructions.
- C. Secure covers to enclosure and tighten bolts to manufacturer-recommended torques to reduce noise generation.
- D. Remove shipping bolts, blocking, and wedges.

### 3.3 CONNECTIONS

- A. Ground equipment in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. Provide flexible connections at conduit and conductor terminations and supports to eliminate sound and vibration transmission to building structure.

### 3.4 ADJUSTING

- A. Record transformer secondary voltage at unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum

is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

- B. Output Settings Report: Prepare written report recording output voltages and tap settings.

END OF SECTION 26 22 13

## SECTION 26 24 16 - PANELBOARDS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Lighting and appliance branch-circuit panelboards.

#### 1.2 DEFINITIONS

- A. GFEP: Ground-fault equipment protection.
- B. MCCB: Molded-case circuit breaker.
- C. VPR: Voltage protection rating.

#### 1.3 ACTION SUBMITTALS

- A. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
  - 3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  - 4. Detail bus configuration, current, and voltage ratings.
  - 5. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

#### 1.5 CLOSEOUT SUBMITTALS

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and prepare panelboards for installation in accordance with NECA 407 .

### PART 2 - PRODUCTS

#### 2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing agency recognized by authorities having jurisdiction, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

- E. Enclosures: Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Other Wet or Damp Indoor Locations: UL 50E, Type 4 .
  - 2. Height: 7 ft maximum.
  - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.
  - 4. Finishes:
    - a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Same finish as panels and trim.
  
- F. Incoming Mains:
  - 1. Location: Bottom Convertible between top and bottom.
  - 2. Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.
  
- G. Phase, Neutral, and Ground Buses:
  - 1. Material: Tin-plated aluminum .
    - a. Plating must run entire length of bus.
    - b. Bus must be fully rated for entire length.
  - 2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.
  - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  - 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.
  - 5. Do not mount neutral bus in gutter.
  
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Tin-plated aluminum .
  - 2. Terminations must allow use of 75 deg C rated conductors without derating.
  - 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  - 4. Main and Neutral Lugs: Mechanical type, with lug on neutral bar for each pole in panelboard.
  - 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with lug on bar for each pole in panelboard.
  
- I. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
  
- J. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
  - 1. Percentage of Future Space Capacity: 20 percent.
  
- K. Panelboard Short-Circuit Current Rating:
  - 1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.
    - a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.



- b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.

## 2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eaton.
  - 2. Siemens Industry, Inc., Energy Management Division.
  - 3. Square D; Schneider Electric USA.
- B. Listing Criteria: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker .
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards in accordance with NECA 407 .
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
  - 1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NECA 407 .
  - 2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
  - 1. Equipment Mounting:
    - a. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.
  - 2. Mount top of trim 7.5 ft above finished floor unless otherwise indicated.
  - 3. Mount panelboard cabinet plumb and rigid without distortion of box.
  - 4. Install overcurrent protective devices and controllers not already factory installed.
    - a. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.

5. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
6. Install filler plates in unused spaces.
7. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

D. Interfaces with Other Work:

1. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

### 3.3 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
  1. Measure loads during period of normal facility operations.
  2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
  3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
  4. Tolerance: Maximum difference between phase loads, within panelboard, may not exceed 20 percent.

### 3.4 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature in accordance with manufacturer's published instructions.

END OF SECTION 26 24 16

## SECTION 26 27 26 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
1. General-use switches, dimmer switches, and fan-speed controller switches.
  2. General-grade duplex straight-blade receptacles.

#### 1.2 DEFINITIONS

- A. Commercial/Industrial-Use Cord Reel: A cord reel subject to severe use in factories, commercial garages, construction sites, and similar locations requiring a harder service-type cord.
- B. UL 1472 Type I Dimmer: Dimmer in which air-gap switch is used to energize preset lighting levels.

#### 1.3 ACTION SUBMITTALS

- A. Product Data:
1. General-use switches, dimmer switches, and fan-speed controller switches.
  2. General-grade duplex straight-blade receptacles.

#### 1.4 INFORMATIONAL SUBMITTALS

#### 1.5 CLOSEOUT SUBMITTALS

### PART 2 - PRODUCTS

#### 2.1 GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED CONTROLLER SWITCHES

- A. Toggle Switch :
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
    - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour; Legrand North America, LLC.
  2. Regulatory Requirements:
    - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
    - b. .
  3. General Characteristics:
    - a. Reference Standards: UL CCN WMUZ and UL 20.
  4. Options:
    - a. Device Color: Gray .
    - b. Configuration:
      - 1) General-duty, 120-277 V, 20 A, single pole three way four way.
  5. Accessories:

- a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
- b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

## 2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

### A. Duplex Straight-Blade Receptacle :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
  - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour; Legrand North America, LLC.
2. Regulatory Requirements:
  - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
3. General Characteristics:
  - a. Reference Standards: UL CCN RTRT and UL 498.
4. Options:
  - a. Device Color: Gray .
  - b. Configuration:
    - 1) Heavy-duty, NEMA 5-20R.
5. Accessories:
  - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
  - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

#### A. Receptacles:

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

#### B. Cord Reels:

1. Examine roughing-in for cord reel mounting and power connections to verify actual locations of mounts and power connections before cord reel installation.
2. Examine walls, floors, and ceilings for suitable conditions where cord reel will be installed.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF SWITCHES

#### A. Comply with manufacturer's instructions.

#### B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Consult Architect for resolution of conflicting requirements.

- C. Identification:
  - 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 26 05 53 "Identification for Electrical Systems."

### 3.3 PROTECTION

- A. Devices:
  - 1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
  - 2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 26 27 26

## SECTION 26 29 13.03 - MANUAL AND MAGNETIC MOTOR CONTROLLERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  1. Combination full-voltage magnetic motor controllers.
  2. Enclosures.
  3. Identification.

#### 1.3 DEFINITIONS

- A. CPT: Control power transformer.
- B. MCCB: Molded-case circuit breaker.
- C. MCP: Motor circuit protector.
- D. NC: Normally closed.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SCPD: Short-circuit protective device.

#### 1.4 ACTION SUBMITTALS

- A. Shop Drawings: For each type of magnetic controller.
  1. Include plans, elevations, sections, and mounting details.
  2. Indicate dimensions, weights, required clearances, and location and size of each field connection.
  3. Wire Termination Diagrams and Schedules: Include diagrams for signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
  4. Include features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

## 1.6 FIELD CONDITIONS

- A. Ambient Environment Ratings: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than 0 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet for electromagnetic and manual devices.
  - 3. The effect of solar radiation is not significant.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL 508 and UL 60947-4-1.
- C. NEMA Compliance: Fabricate motor controllers to comply with ICS 2.

### 2.2 COMBINATION FULL-VOLTAGE MAGNETIC MOTOR CONTROLLER

- A. Description: Factory-assembled, combination full-voltage magnetic motor controller consisting of the controller described in this article, indicated disconnecting means, SCPD and OCPD, in a single enclosure.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eaton.
  - 2. Siemens Industry, Inc., Energy Management Division.
  - 3. Square D; Schneider Electric USA.
- C. Standard: Comply with NEMA ICS 2, general purpose, Class A.
- D. Configuration: Nonreversing .
- E. Contactor Coils: Pressure-encapsulated type.
  - 1. Operating Voltage: Manufacturer's standard, unless indicated.
- F. Control Power:
  - 1. For on-board control power, obtain from line circuit or from integral CPT. The CPT shall have capacity to operate integral devices and remotely located pilot, indicating, and control devices.
    - a. Spare CPT Capacity as Indicated on Drawings: 100 VA.
- G. Overload Relays:
  - 1. Thermal Overload Relays:
    - a. Inverse-time-current characteristic.
    - b. Class 20 tripping characteristic.
    - c. Heaters in each phase shall be matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
- H. MCP Disconnecting Means:
  - 1. UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

2. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

## 2.3 ENCLOSURES

- A. Comply with NEMA 250, type designations as indicated on Drawings, complying with environmental conditions at installed location.
- B. The construction of the enclosures shall comply with NEMA ICS 6.
- C. Controllers in hazardous (classified) locations shall comply with UL 1203.

## 2.4 ACCESSORIES

- A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
  1. Push Buttons, Pilot Lights, and Selector Switches: Standard-duty, except as needed to match enclosure type. Heavy-duty or oil-tight where indicated in the controller schedule.
    - a. Push Buttons: As indicated on the drawings.
    - b. Pilot Lights: As indicated on the drawings.
    - c. Selector Switches: As indicated on the drawings.

## 2.5 IDENTIFICATION

- A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 26 05 53 "Identification for Electrical Systems," for each compartment, mounted with corrosion-resistant screws.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with the motors, and other conditions affecting performance of the Work.

### 3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wall-Mounted Controllers: Install magnetic controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 26 05 29 "Hangers and Supports for Electrical Systems" unless otherwise indicated.
- C. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- E. Setting of Overload Relays: Select and set overloads on the basis of full-load current rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for motors that are high-torque, high-efficiency, and so on.



### 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

### 3.4 SYSTEM FUNCTION TESTS

- A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.
  - 1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
  - 2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
  - 3. Verify the correct operation of sensing devices, alarms, and indicating devices.
- B. Motor controller will be considered defective if it does not pass the system function tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 26 29 13.03

## SECTION 26 50 00 - LIGHTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Luminaires.
- B. Related Requirements:
  - 1. Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" specifies wiring connections installed by this Section.
  - 2. Section 26 05 29 "Hangers and Supports for Electrical Systems" specifies channel and angle supports installed by this Section.
  - 3. Section 26 05 53 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.

#### 1.2 DEFINITIONS

- A. BUG Rating: Backlight, uplight, and glare rating for light pollution from exterior luminaires.
- B. CMH: Ceramic metal halide.
- C. Correlated Color Temperature (CCT): The absolute temperature (in kelvins) of a blackbody whose chromaticity (color quality) most nearly resembles that of the light source.
- D. Color Rendering Index (CRI): The measure of the degree of color shift objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference light source. The lower the CRI of a light source, the more difficult it is to identify colors and stripes on electronic components and wiring.
- E. HPS: High-pressure sodium.

#### 1.3 ACTION SUBMITTALS

- A. Product Data:
  - 1. For luminaires.
    - a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
      - 1) If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
      - 2) Listing criteria identified in approval letter must match specified listing criteria. Approval of only equipment's enclosure is not considered approval of equipment for intended application.
      - 3) Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for similar products are not acceptable.
    - b. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
    - c. Include operating characteristics, electrical characteristics, and furnished accessories.

- d. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on Drawings.
- e. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
- f. Include photometric data and adjustment factors obtained from qualified laboratory tests.
- g. Include manufacturer's sample warranty language.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect exposed surface finishes on lighting equipment by applying strippable, temporary protective covering before shipping.

### PART 2 - PRODUCTS

#### 2.1 LUMINAIRES

##### A. Performance Criteria:

##### 1. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- b. See individual product types below for listing criteria.
- c. Marked in accordance with UL CCN HYXT, including UL 1598, for compatible power supply, installation location, and environmental conditions.

##### B. Surface-Mounted Luminaire :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Cooper Lighting Solutions; Signify North America Corp.
2. Product Description: Pendant mounted luminaires .
3. Product Characteristics:
  - a. Nominal Operating Voltage: 277 V(ac) .
  - b. Nominal Luminaire Operating Power Rating: 70 to 150 W .
  - c. CRI: 80+ .
  - d. Ballast or Driver Location: Internal .
  - e. Materials:
    - 1) Enclosure: ASTM A36/A36M carbon structural steel housing and heat sink; free of sharp edges and burrs.
    - 2) Enclosure Ingress Protection Rating: UL 50E Type 1 or IEC 60529 IP20 .
    - 3) Visible variations in metal finishes are unacceptable in adjoining components.
  - f. LED Luminaires (UL CCN IFAM):
    - 1) Output Intensity: Not less than 12,000 .
    - 2) Efficacy: Not less than 170 .
    - 3) Rated Life: 50 000 hours to L70.
4. Required Product Options:
  - a. Mounting Hardware: Pendant-mounted ; .
  - b. Finishes:
    - 1) Enclosure: white painted finish.
  - c. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
    - 1) Surface Preparation: Clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and

- rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
- 2) Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
  - d. Visible variations in metal finishes are unacceptable in adjoining components.
  - e. Dimmable from 100 percent to zero percent of maximum light output.
  - f. Stainless steel latches.
- 5. Installation Markings:
  - a. LED Luminaires (UL CCN IFAM):
    - 1) "SUITABLE FOR OPERATION IN AMBIENTS NOT EXCEEDING 55 °C."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Shop Drawings: Prepare and submit the following:
  - 1. Drawings, Diagrams, and Supporting Documents for Custom Luminaires:
    - a. Include plans, elevations, sections, and mounting and attachment details.
    - b. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - c. Include diagrams for power, signal, and control wiring.
- B. Temporary Lighting: If approved by Architect, specified luminaires for Project may be installed for temporary lighting. Install and energize minimum quantity of luminaires necessary to meet needs of construction activities. When construction is sufficiently complete, remove, disassemble, clean, and relamp luminaires used for temporary lighting before reinstalling for Project delivery.

### 3.3 INSTALLATION OF LIGHTING

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
  - 1. Installation of Indoor Lighting Systems: NECA NEIS 500.
  - 2. Installation of Exterior Lighting Systems: NECA NEIS 501.
  - 3. Installation of Industrial Lighting Systems: NECA NEIS 502.
- C. Special Installation Techniques:
  - 1. Install luminaires level, plumb, and square with finished floor or grade unless otherwise indicated.
  - 2. Install luminaires at height and aiming angle as indicated on Drawings.
  - 3. Coordinate layout and installation of luminaires with other construction.

4. Adjust luminaires that require field adjustment or aiming.
  5. Suspended Luminaire Support:
    - a. Pendants and Rods: Where longer than 48 inch, brace to limit swinging.
    - b. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
  6. Install wiring connections for luminaires.
  7. Identification: Provide labels for luminaires and associated electrical equipment.
    - a. Identify field-installed conductors, interconnecting wiring, and components.
    - b. Provide warning signs.
    - c. Label each enclosure with engraved metal or laminated-plastic nameplate.
  8. .
- D. Systems Integration: Integrate lighting control devices and equipment with electrical power connections for operation of luminaires as specified.

### 3.4 PROTECTION

- A. After installation, protect lighting equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 26 50 00

## SECTION 26 56 19 - LED EXTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Luminaire types.
  - 2. Materials.
  - 3. Finishes.
  - 4. Luminaire support components.

#### 1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaire.
  - 4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
  - 5. Wiring diagrams for power, control, and signal wiring.
  - 6. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

#### 1.4 QUALITY ASSURANCE

- A. Provide luminaires from a single manufacturer for each luminaire type.
- B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

#### 1.6 FIELD CONDITIONS

- A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

- B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

### 2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. CRI of 80 . CCT of 3000 K .
- F. L70 lamp life of 50,000 hours.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.
- I. Nominal Operating Voltage: 277 V ac .
- J. In-line Fusing: .
- K. Lamp Rating: Lamp marked for outdoor use .

### 2.3 LUMINAIRE TYPES

- A. Area and Site:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Lithonia Lighting; Acuity Brands Lighting, Inc.
  - 2. Mounting: Building
  - 3. Distribution: Type IV .
  - 4. Diffusers and Globes: Prismatic acrylic .
  - 5. Housings:
    - a. die-cast aluminum .
    - b. powder-coat finish.

### 2.4 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during

relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

C. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

D. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:
  - a. "USE ONLY" and include specific lamp type.
  - b. CCT and CRI for all luminaires.

## 2.5 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
- C. Examine walls, roofs, for suitable conditions where luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 TEMPORARY LIGHTING

- A. If approved by Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Install lamps in each luminaire.
- C. Fasten luminaire to structural support.
- D. Supports:
  1. Sized and rated for luminaire weight.
  2. Able to maintain luminaire position after cleaning and relamping.
  3. Support luminaires without causing deflection of finished surface.



4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
  - E. Wall-Mounted Luminaire Support:
    1. Attached to structural members in walls .
  - F. Wiring Method: Install cables in raceways. Conceal raceways and cables.
  - G. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
  - H. Coordinate layout and installation of luminaires with other construction.
  - I. Adjust luminaires that require field adjustment or aiming.
  - J. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 05 33.13 "Conduits for Electrical Systems" for wiring connections and wiring methods.
- 3.4 CORROSION PREVENTION
- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
  - B. Steel Conduits: Comply with Section 26 05 33.13 "Conduits for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.
- 3.5 IDENTIFICATION
- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

END OF SECTION 26 56 19

## SECTION 31 10 00 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Removing existing vegetation.
  - 2. Clearing and grubbing.
  - 3. Stripping and stockpiling topsoil.
  - 4. Removing above- and below-grade site improvements.
  - 5. Disconnecting, capping or sealing, and removing site utilities.

#### 1.2 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated according to requirements in Section 01 5 6 .39 "Temporary Tree and Plant Protection."
- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

#### 1.3 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing. Use sufficiently detailed photographs or video recordings.

#### 1.5 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify 811 Miss Dig for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."
  1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.
- C. Protect existing site improvements to remain from damage during construction. Restore damaged improvements to their original condition, as acceptable to Owner.

### 3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.3 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
  1. Arrange with utility companies to shut off indicated utilities.
  2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  1. Notify Owner not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Owner's written permission.

- C. Excavate for and remove underground utilities indicated to be removed.

### 3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction as indicated on Drawings.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
  - 3. Use only hand methods or air spade for grubbing within protection zones.
  - 4. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

### 3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water.
  - 1. Limit height of topsoil stockpiles to 72 inches.
  - 2. Do not stockpile topsoil within protection zones.
  - 3. Dispose of surplus topsoil and legally dispose of off-site. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

### 3.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction. Remove slabs, fences, walls, paving, curbs, gutters, and aggregate/concrete base as indicated. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

### 3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00

## SECTION 31 20 00 - EARTH MOVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating and filling for rough grading the Site.
  - 2. Preparing subgrades for walks, pavements, turf and grasses, and plants.
  - 3. Aggregate base for concrete walks and asphalt pavements.
  - 4. Subsurface drainage backfill for walls.
  - 5. Soil separating geotextile.

#### 1.2 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
- B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- D. Fill: Soil materials used to raise existing grades.
- E. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct pre-excavation conference at Project site. Review methods and procedures related to earthmoving

#### 1.4 SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
  - 1. Classification according to ASTM D2487.
  - 2. Laboratory compaction curve according to ASTM D698.
- C. Product Data: For each type of the following manufactured products required:
  - 1. Geotextile fabric.

#### 1.5 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify 811 Miss Dig for area where Project is located before site clearing.

- C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures and plant-protection measures specific in Section 01 5 6 .39 "Temporary Tree and Plant Protection" are in place.
- D. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- E. Do not direct vehicle or equipment exhaust towards protection zones.
- F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: In accordance with MDOT Standard Specifications for Construction Section 205 Roadway Earthwork (unless otherwise specified in project Geotechnical Report).
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups (unless otherwise specified in the project Geotechnical Report).
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Aggregate Base Course: MDOT Manual Section 302 Aggregate Base Course (limestone, or crushed gravel only, slag aggregate not permitted).
- E. Subsurface Drainage Backfill: Washed #57 limestone only.
- F. Engineered Fill: MDOT Standard Specifications for Construction for Granular Material Class II.

### 2.2 GEOTEXTILES

- A. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: As follows:
    - a. Grab Tensile Strength: 247 lbf; ASTM D4632.
    - b. Sewn Seam Strength: 222 lbf; ASTM D4632.
    - c. Tear Strength: 90 lbf; ASTM D4533.
    - d. Puncture Strength: 90 lbf; ASTM D4833.
  - 2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
  - 3. Permittivity: 0.02 per second, minimum; ASTM D4491.
  - 4. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

### 3.2 EXPLOSIVES

- A. Explosives: Do not use explosives.

### 3.3 EXCAVATION

- A. Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Excavated materials may include rock, soil materials, and obstructions. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Excavate surfaces under walks, pavements, and landscape areas to indicated lines, cross sections, elevations, and subgrades.

### 3.4 SUBGRADE INSPECTION

- A. Notify Engineer when excavations have reached required subgrade or when existing subgrades are ready for filling operations.
- B. If project Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, without additional compensation.

### 3.5 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### 3.6 BACKFILL (WALLS AND FOUNDATIONS)

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, or waterproofing.
  - 2. Removing concrete formwork.
  - 3. Removing trash and debris.

- B. Place backfill on subgrades free of mud, frost, snow, or ice.

### 3.7 SOIL FILL

- A. Prior to soil fill, Contractor shall inspect existing subgrades accordingly to section 3.04.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material (unless noted otherwise in project Geotechnical Report).
- C. Place and compact fill material in layers to required elevations as follows (unless noted otherwise in project Geotechnical Report):
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under footings and foundations, use engineered fill.
- D. Place soil fill on subgrades free of mud, frost, snow, or ice.

### 3.8 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight. (Unless noted otherwise in project Geotechnical Report)

### 3.9 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Compact subgrade and bases according to MDOT Standard Specifications for Construction Section 205 Roadway Earthwork (unless noted otherwise in project Geotechnical Report), and no less than the following conditions:
  - 1. Under steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

### 3.10 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
  - 2. Walks: Plus or minus 1 inch.
  - 3. Pavements: Plus or minus 1/2 inch.

### 3.11 AGGREGATE BASE COURSE UNDER PAVEMENTS AND WALKS

- A. Place aggregate base course on subgrades free of mud, frost, snow, or ice.



- B. On prepared subgrade, place subbase course under pavements and walks according to MDOT Standard Specifications for Construction Section 302 Aggregate Base Course.

### 3.12 FIELD QUALITY CONTROL

- A. Owner shall engage a qualified geotechnical engineering agency to perform the following tests and special inspections:
  - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
  - 2. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Contractor shall allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:
  - 1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area but in no case fewer than three tests.
  - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### 3.13 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions. Scarify or remove and replace soil material; reshape and recompact.
- B. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

## SECTION 32 11 00 - BASE COURSES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. ASTM D 6938 "Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods"
- C. ASTM D 1557 "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort"
- D. Michigan Department of Transportation Density Testing and Inspection Manual (rev 2014)

#### 1.2 SUMMARY

- A. Work shall include furnishing of labor, materials, tools, equipment, accessories, and services necessary for completing the placement and inspection of the items as shown on the contract drawings and/or as herein required. This also includes proof rolling, preparing subgrade, placing and compacting base courses, and required remedial action, and the disposal of unsuitable material.
- B. Section Includes:
  - 1. Subgrade Preparation and Inspection
  - 2. Subgrade Undercut
  - 3. Base aggregate course placement and compaction.
  - 4. Surface course aggregate.
- C. Related Sections:
  - 1. Division 01 Section "Temporary Facilities and Controls".
  - 2. Division 31 Section "Excavation and Fill"
  - 3. Division 32 Sections for "Concrete Paving".

#### 1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
- B. Base Course: Aggregate soil layer placed above subgrade and below pavement, above subbase and below pavement, or above subgrade and below sidewalk.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- E. Fill: Soil materials used to raise existing grades.
- F. Pavement: Portland Cement Concrete or Hot-Mix Asphalt (HMA) installed over an aggregate base course for supporting vehicular traffic and/or parking.

- G. Sidewalk: Portland Cement Concrete installed over a granular base course for supporting pedestrian traffic.
- H. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- J. Surface Course: Top layer of an aggregate cross section.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

#### 1.4 SUBMITTALS

- A. Material Test Reports: For each borrow soil material proposed as follows:
  1. Classification according to D 2487.
  2. Laboratory compaction curve according to ASTM D 1557.

#### 1.5 QUALITY ASSURANCE

- A. References to Michigan Department of Transportation (MDOT) Specifications shall pertain to the current edition of the Standard Specifications for Construction.

#### 1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during PAVING operations.
  1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Maintain erosion control measures during base and paving work.

### PART 2 - PRODUCTS

#### 2.1 SOIL MATERIALS - GENERAL

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

#### 2.2 SURFACE/BASE AGGREGATES

- A. Granular Material: shall meet the requirements of Section 902.07 of the MDOT Standard Specifications for Construction for Granular Material for Fill and Subbase.
- B. Stone Aggregate shall meet the requirements of Section 902.05 of the MDOT Standard Specifications for Construction for Coarse Aggregate or approved salvaged on-site material.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Excavation and filling operations shall be complete prior to placing base courses.
- B. Trenching and backfilling operations shall be complete prior to placing base courses over trenches.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Subgrade shall be graded and compacted prior to placing subbase or base course(s).

### 3.2 SUBGRADE INSPECTION

- A. Contractor shall proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. If Engineer or Owner's Representative determines that unsatisfactory soil is present – perform "SUBGRADE UNDERCUT". Subgrade undercut performed by the Contractor in areas designated for Fill or Embankment under this contract shall be performed at the expense of the Contractor.
- C. Contractor shall reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

### 3.3 SUBGRADE UNDERCUT

- A. Undercut and remove unsatisfactory soils to depth and horizontal extents as directed by the Engineer or Owner's Representative.
- B. Replace the removed material with fill, grade and compact to the plan-indicated subgrade elevations in accordance with the FILL materials and procedures as specified in Section 31 23 00 "Excavation and Fill."
- C. Contractor shall underlay fill material with a Stabilization Geotextile as specified in MDOT Specification Table 910-1 placed atop soft soil and fill with compacted granular material, as directed by the Owner's Representative.

### 3.4 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
  - 2. Do not store in protection zones, 100-year floodplain, or wetlands, as identified on the plans.

### 3.5 SUBBASE

- A. Where identified on the plans and in the applicable details, Contractor shall place and compact a subbase course of GRANULAR MATERIAL atop the subgrade, prior to placing base aggregate course.

- B. Compact subbase according to "COMPACTION."

### 3.6 AGGREGATE BASE COURSE FOR PAVING

- A. In areas to receive concrete pad or HMA pavement, Contractor shall place a base course of STONE AGGREGATE, as identified on the plan, on subgrades or subbase free of mud, frost, snow, organics, or ice as specified in the project plans and details. Thickness and top of base course grades shall match project plans and details.
- B. Compact base course according to "COMPACTION."

### 3.7 GRANULAR BASE COURSE FOR SIDEWALK

- A. Contractor shall place a base course of GRANULAR MATERIAL, as identified on the plan, on prepared subgrades free of mud, frost, snow, or ice as specified in the project plans and details. Thickness and top of base course grades shall match project plans and details.
- B. Compact granular base course according to "COMPACTION."

### 3.8 COMPACTION

- A. Base courses shall be placed in lift thickness as needed to achieve density.
- B. Each lift shall be compacted by the contractor to 95% of maximum unit weight, as verified in accordance with the "Density Testing of Base Courses" paragraph below. Additional lifts of subbase, base course and/or pavement shall not be placed until acceptable compaction has been achieved and verified on the underlying lift.
- C. Maximum unit weight will be determined by ASTM D 1557, current methods of Test for Compaction and Density of Soil, AASHTO Designation T-180 or by the Cone Density Method developed by MDOT, as directed by the Owner or Owner's Representative.
- D. When compaction methods are not suitable to obtain the specified compaction, the Contractor shall, at his expense, remove unsuitable materials and replace with specified material.
- E. Compaction of material shall be obtained with the use of a vibratory roller, mechanical tamper, excavator mounted compactor, or other similar and effective equipment. Compaction shall be performed by the contractor at his expense, in order to satisfy the density requirements of this contract.
- F. Density Testing
  1. Density of compacted material shall be verified in-place by the Owner's Representative in accordance with ASTM D 6938 (nuclear gauge).
  2. The Contractor shall be informed of all density test results as they are recorded.
  3. Contractor is responsible for providing and maintaining safe and reasonable access for a field engineer or technician to verify the compaction of each lift of base course.

### 3.9 REMOVAL AND TRANSPORT OF EXCAVATED MATERIAL

- A. Unsuitable material that remains after base course activities shall be handled and disposed on site at the spoils berm.

### 3.10 FIELD QUALITY CONTROL

- A. Special Inspections: Contractor shall engage a qualified testing agency to perform the following special inspections:
  - 1. Determine that fill material and maximum lift thickness comply with requirements and are appropriate to achieve density.
  - 2. Determine, at the required test frequency, that in-place density of compacted fill complies with requirements.
- B. Contractor shall allow testing agency to inspect and test subgrades and each layer of base course. Proceed with subsequent work only after test results for previously completed work comply with requirements.
- C. When testing agency reports that base courses have not achieved the degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained. Material shall be replaced at the expense of the contractor if repeated tests are not verified as acceptable to the testing agency.

### 3.11 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION 32 11 00

## SECTION 32 13 13 - CONCRETE PAVING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes Concrete Paving. Including the Following:
  - 1. Curbs and gutters.
  - 2. Walks.
  - 3. Concrete Pavements.
- B. Concrete finishing.
- C. Concrete paving joints.

#### 1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 "Cast-In-Place Concrete" for general building applications of concrete

#### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to concrete paving.

#### 1.5 ACTION SUBMITTALS

- A. Product Data and Manufacturer Material Certificates: For each type of product specified.
- B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.
- D. Material Test Reports: Aggregates and all cementitious materials.

#### 1.6 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products, complying with ASTM C94/C94M requirements for production facilities and equipment, and registered with and approved by the DOT of state in which Project is located.
- B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.

## 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Contractor or manufacturer to engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures for verification of submitted properties of the mix design trial batch.
- B. Alkali Silica Reactivity (ASR). All concrete mixtures shall utilize one of the requirements below to mitigate any potential of ASR.
  - 1. The Contractor must submit documentation the concrete mixture does not present the potential for excessive expansion caused by ASR. Provide one of the following Test Certifications showing conformance with specified criterion:
    - a. Method 1: ASTM C 1260 Mortar Bar Test. If the expansion of the mortar bars is less than 0.10% at 14 days of immersion, the fine aggregate is considered non-deleterious to ASR reactivity and may be used in the concrete.
    - b. Method 2: ASTM C 1293 Concrete Prism Test. If the expansion of concrete prisms is not greater than 0.040% after one year, the aggregate is considered non-deleterious to ASR reactivity and may be used in the concrete.

## 1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Comply with ACI 306.1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Do not use frozen materials or materials containing ice or snow. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

## 1.9 STANDARDS

- A. Materials and methods of construction shall comply with the following standards, unless modified herein (if there is a conflict between standards, more stringent requirement shall be required):
  - 1. State of Michigan, Department of Transportation Standard Specifications for Construction, most current edition.
  - 2. American Society for Testing and Materials (ASTM).
  - 3. ACI Publications: Comply with ACI 301, unless modified herein.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. Comply with MDOT Standard Specifications for Construction Section 6 Portland Cement Concrete Pavements unless modified herein.



## 2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

## 2.3 CONCRETE MATERIALS

- A. Provide concrete materials (cementitious materials, normal weight aggregates, air entraining admixture, chemical admixtures, and potable water in accordance with MDOT Standard Specifications for Construction Sections 901, 902, and 903 as modified herein:
  - 1. Limit cementitious materials to Portland Cement per ASTM C150/C150M, gray portland cement Type I/II and Ground Granulated Slag Cement per ASTM C989/C989M, Grade 100 or 120 (Fly Ash is not permitted).
  - 2. Normal weight aggregates shall be limited to limestone or gravel only (crushed air-cooled blast furnace slag is NOT permitted).
- B. Water: Potable and complying with ASTM C94/C94M.

## 2.4 CURING AND SEALING MATERIALS

- A. Clear, Waterborne, Acrylic, Curing and Sealing Compound: ASTM C309, Type 1, Class, B.
- B. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A, manufactured for use with colored concrete.

## 2.5 RELATED MATERIALS

- A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber in preformed strips.

## 2.6 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures, in according to MDOT Standard Specifications for Construction Division 6 Portland Cement Concrete Pavements, for each type and strength of normal-weight concrete.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

## 2.7 CONCRETE MIXTURES

- A. Proportion normal-weight concrete mixture as follows:
  - 1. Concrete Pavement Type #1: MDOT Standard Specifications for Construction Section 601, Concrete Grade type as specified and modified herein:
    - a. Limit GGBFS cement volume to 30% maximum.
    - b. Limited to normal weight natural aggregate (limestone or gravel) only.
    - c. Minimum Compressive Strength: 3,500 PSI at 28 days.
    - d. Maximum Water-Cementitious Material Ratio: 0.45.
    - e. Slump Limit: Maximum 3 inches. Nominal slump may be increased to 6 inches provided the increase is achieved by adding a mid-range water reducer.
    - f. Air Content: 6.5 percent, plus or minus 1.5 percent.

- g. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd. where fiber reinforced concrete is indicated on drawings.

## 2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to MDOT Standard Specifications for Construction Division 6 and 8. Furnish batch certificates for each batch discharged and used in the Work. When air temperature is below 60 deg F the maximum time between charging the mixer to placement of the concrete is 90 minutes. When the air temperature is between 60 and 85 deg F the time is reduced to 60 minutes with the exception if the mix includes a Water-Reducing Retarding admixture then the time remains 90 minutes. For air temperatures over 85 deg F the time is reduced to 45 minutes with the exception if the mix includes a Water-Reducer Retarding admixture then the time is reduced to 70 minutes.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Provide Landscape Architect / Engineer opportunity to observe forms in place at least 24 hours prior to pouring concrete.
- C. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 JOINTS

- A. General: Form construction, isolation / expansion, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated. When joining existing paving, place transverse joints to align with previously placed joints and intermediate cracks unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation / Expansion Joints: Form joints of preformed joint-filler strips abutting catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
  - 1. Locate pedestrian sidewalk expansion joints at intervals of 30 feet unless otherwise indicated on Drawings.

2. Extend joint fillers full width and depth as indicated on Drawings.
  3. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
- D. Contraction / Control Joints: Form weakened-plane contraction / Control joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks. Ensure that sawed joints centered over doveled joints, where doveled joints are indicated on Drawings.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces, unless indicated otherwise on Drawings.

### 3.5 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in, where required.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with the following for measuring, mixing, transporting, and placing concrete and as follows:
1. For walks, curb ramps, and steps, comply with. MDOT Standard Specifications for Construction Section 803 Concrete Sidewalk, Sidewalk Ramps, and Steps.
  2. For curbing, comply with. MDOT Standard Specifications for Construction Section 802 Concrete Curb, Gutter and Dividers.
- E. Do not add water to fresh concrete after testing.

### 3.6 STANDARD BROOM FINISH

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
- C. Refer to Section 32 13 16 Decorative Concrete for finishing of decorative concrete areas.

### 3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Areas to receive staining must be cured using moisture-retaining cover. Do not apply curing compound to areas to receive staining.
- E. Curing Methods: Cure concrete by one of the following methods:
  - 1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
  - 2. Curing or Curing and Sealing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

### 3.8 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
  - 1. Elevation: 3/4 inch.
  - 2. Thickness: Minus 1/4 inch, no plus.
  - 3. Joint Spacing: 3 inches.
  - 4. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 5. Joint Width: Plus 1/8 inch, no minus.

### 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner shall engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 4. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no

compressive-strength test value falls below specified compressive strength by more than 500 psi.

- D. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Landscape Architect / Engineer.
- E. Concrete paving will be considered defective if it does not pass tests and inspections.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.10 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint.
- B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement and has obtained the 28 day compressive strength requirement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

## SECTION 33 41 00 - STORM SEWERS, UNDERDRAINS AND DRAINAGE STRUCTURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Underdrain pipe
  - 2. Storm sewer piping
  - 3. Storm sewer round culvert
  - 4. Storm Inlet Structures, manholes, and catch basins
  - 5. Storm pipe end sections
  - 6. Storm water treatment structures

#### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. References to the Michigan Department of Transportation (MDOT) Specifications shall pertain to the 2020 Standard Specifications for Construction.
- C. References to the American Association of State Highway and Transportation Officials (AASHTO) Specifications shall pertain to the current edition of the standard.
- D. AASHTO M252 – Standard Specification for Corrugated Polyethylene Drainage Pipe
- E. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
- F. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- G. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- H. ASTM C478 - Specification for Precast Reinforced Concrete Manholes Sections

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties:
  - 1. Pipe
- B. Shop Drawings: Include plans, elevations, sections, details, frames, covers, and grates.
  - 1. Concrete storm structures and end sections
  - 2. Storm water outlet / discharge control structures
  - 3. Drainage structure casting, covers, and grates
  - 4. Storm water treatment structures

#### 1.4 **INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- B. Product Certificates: For each type of pipe and fitting, from manufacturer.
- C. Field quality-control reports.

#### 1.5 **PROJECT CONDITIONS**

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Owner no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of service without Owner's written permission.

### **PART 2 - PRODUCTS**

#### 2.1 **SEWER PIPE, ROUND CULVERT, AND UNDERDRAIN**

- A. Sewer pipe shall be of the type and class designated for the specific locations or intended use shown or noted on the project plans.
- B. Any deviation from the type or class of pipe shown on the plans will not be permitted except upon receipt of written approval of the Owner's representative.
- C. Dual-Walled HDPE Pipe
  - 1. Type: A-2000, N-12 or approved equal.
  - 2. Specification AASHTO M252, Type S or SP
  - 3. Joints: Coupling Band per AASHTO M252
- D. End Sections
  - 1. Type: High density polyethylene conforming with the minimum requirements of cell classification 213320C or 16 ga aluminized corrugated metal.
  - 2. Specification: AASHTO D3350
  - 3. Joints: Coupling Band per AASHTO M252
- E. Building Connections
  - 1. Material: Polyvinyl Chloride (PVC) sewer pipe, schedule 40 or SDR 35.
  - 2. Specification: ASTM D 1785

#### 2.2 **STORM DRAINAGE INLETS, CATCH BASINS, AND MANHOLES**

- A. Pre-cast Concrete
- B. See details on the plans
- C. Manhole Frames and Covers: Per Plan and Detail

#### 2.3 **STORM PIPE END SECTIONS**

- A. End sections shall be made of the same material as the pipe they are connecting to.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Excavation, trenching, and backfilling are specified in Section 31 22 .00 "Excavation and Fil."
- B. Excavations shall be of sufficient widths and depths to provide adequate room for the construction and installation of the work to the lines, grades, and dimensions called for on the drawings.
- C. If the maximum trench width specified in the Earth Moving Section is exceeded (unless otherwise shown on the drawings), the Contractor shall install, at his own expense, such concrete cradling or other bedding as approved by the Owner's Representative to support the added load of the backfill.
- D. Install pipe, fittings, and appurtenances in strict accordance with the manufacturer's recommendations and these Specifications.
- E. Any deviation from the following procedures that results in the requirement that the Contractor correct or repeat work or remove or replace materials shall be performed by the Contractor at no additional cost to the Owner.

### 3.2 LAYING PIPE

- A. Handling Pipe & Fittings
  - 1. All pipes and castings shall be unloaded and distributed along the line of work in such manner and with such care as will effectually avoid damage to any pipe or fitting. Dropping pipe or fittings directly from the truck will not be permitted. Care must also be taken to prevent abrasion of the pipe.
- B. Placement of Pipe
  - 1. Each pipe shall be checked for defects prior to being lowered into the trench. The inside of the pipe and the outside of the spigot shall be cleaned of any dirt or foreign matter.
  - 2. Construction shall begin at the outlet end and proceed upgrade with spigot ends pointing in the direction of flow. Pipes shall be laid on a minimum four (4) inch aggregate/stone bedding. A thicker bedding shall be provided if called for on the plan details, at no additional cost to the Owner. If the subgrade has been disturbed so that refilling is necessary to bring the pipe to grade, such refilling shall be done with sand or gravel thoroughly tamped in place. Bell holes shall be excavated so that the full length of the pipe barrel will bear uniformly on the sand bedding.
  - 3. Pipes shall be centered in bells or grooves and pushed tight together to form a smooth and continuous invert. After laying pipe, care shall be taken so as not to disturb its line and grade. Any pipe found off grade or out of line shall be re-laid properly by the Contractor.
- C. Line and Grade
  - 1. All pipe shall be laid to line and grade called for on the drawings. Each pipe, as laid, shall be checked by the Contractor with line and grade pole or other device to insure this result is obtained. The finished work shall be straight and shall be sighted through the pipe between manholes.
- D. Excavation to 18 inches Below Bottom of Pipe
  - 1. As a result of the Contractor's construction procedure or where excavation has not uncovered a stable foundation subgrade at a depth of six (6) inches below the bottom of pipe, the Contractor shall continue to excavate downward to a maximum distance of



eighteen (18) inches below the bottom of pipe to reach stable foundation soil. The space resulting from such excavation and the pipe bedding shall be filled and constructed in the same manner and using the same materials specified in the Earth Moving Section. All costs for such construction shall be borne by the Contractor.

2. No claims for additional payment shall be accepted for additional excavation in areas where pipe is proposed to be installed atop fill material placed under this contract.

E. Excavation Below Limits Specified in above Paragraph D.

1. Where excavation has not uncovered a stable, foundation subgrade at depths eighteen (18) inches below the bottom of pipe, then the Contractor shall stop further excavation and immediately notify the Owner's Representative of the condition and of his intent to make a claim for additional cost. The Owner's Representative shall investigate the soil conditions and may direct the Contractor to continue excavating if it appears that a stable subgrade can be obtained. Material for refill of the undercut area shall be as described in the Earth Moving Section. In the event that soil conditions are extremely severe, then the Owner's Representative shall investigate the site conditions and shall prescribe the appropriate pipe support system to be used. Within ten (10) days after the Owner's Representative determines the appropriate pipe support system to be used, the Contractor shall submit a detailed estimate for additional cost, excluding the costs to be borne by the Contractor in the above paragraph "D." The estimate shall include only those additional costs necessary to construct the pipe support system as directed by the Owner's Representative. It shall not include construction costs prior to the stoppage of work.

F. Laying and Bedding of PVC and HDPE Pipe

1. Bedding of PVC and HDPE Pipe shall be in accordance with current ASTM specifications.
2. Potential damage can occur to exterior walls of PVC and HDPE Pipe, particularly under cold weather conditions if rocks, frozen material, or large objects strike the pipe. The Contractor shall carefully avoid dumping any materials other than approved bedding sand or stone on the pipe until a 12-inch cover is placed on it. Pipe walls and joints shall also be protected from abrasion and damage during handling and shall be fully checked just prior to placing in the trench.
3. Care shall be taken during bedding compaction to avoid distorting the shape of the pipe or damaging its exterior wall.
4. Cutting of pipe, where required, shall be performed by the use of tools or equipment that will provide a neat, perpendicular cut without damage to the pipe material.
5. Bowing or warping of pipe can occur with temperature fluctuations. The Contractor shall store and protect the pipe to minimize bowing. Nominal 12'-6" pipe lengths that have deviations from straight greater than one (1) inch shall not be used.

G. Concrete Cradle for Pipe

1. Where called for on the drawings, or otherwise required, pipe shall be installed with a concrete cradle of MDOT Grade S3 concrete.
2. Each pipe shall rest on a 6-inch minimum thickness bed of dry mix concrete that is shaped to fit the bottom of the pipe. The dry mix concrete shall be MDOT Grade S3 or Engineer-approved equal.
3. After setting the pipe, the space between the outside of the pipe and the undisturbed trench bank shall be filled to a level equal to a point 1/3 of the diameter above the pipe invert with MDOT Grade S3. The concrete shall have a five (5) inch slump and be mechanically vibrated to insure complete filling of the annular space between the excavated face of the original ground and the outside face of the pipe.

H. Jointing

1. Where pipe is laid in wet trenches, trenches with running sand, or in trench conditions where manual means will not allow pushing the pipe home, the Contractor shall provide and use mechanical means for pulling the pipe home and holding the pipe joints tight until completion of the line. Mechanical means shall consist of a cable placed inside the pipe with a suitable winch, jack, or come-along for pulling the pipe home and holding the pipe in position.
2. All joints on elliptical concrete pipe (42-inch equivalent diameter and larger) shall be cement mortar pointed on the inside. On bituminous mastic joints the compound shall be removed to a depth of three-quarters (3/4) of an inch from the inside of the joint before pointing.

I. Backfill

1. Backfill shall be placed in accordance with the Earth Moving Section.

### 3.3 **STORM DRAINAGE STRUCTURES**

- A. Construction methods for drainage structures shall conform to MDOT Specification 403.03 except as herein provided.
- B. All precast sections shall bear the stamp of an approved laboratory as having been tested and delivered from tested stock of the manufacturer, at the expense of the Contractor.
- C. Precast sections shall be constructed so that no more than fifty (50) percent of the circumference, measured on the inside face, is deleted on any horizontal plane for sewer pipe openings. There shall be no less than twelve (12) inches of residual concrete measured on any horizontal plane between pipe openings.
- D. Excavation shall be carried to the depth required to permit the construction of the base in accordance with the requirements of the Standard Details. The excavation shall be sufficiently wide to allow for shoring, bracing, or formwork, should any or all be necessary. Also, the excavation shall allow for accessibility in plastering the exterior of all brick masonry. The bottom of the excavation shall be trimmed to a uniform horizontal bed to receive the concrete base. The excavated section shall be completely dewatered before any concrete is placed therein, at the expense of the Contractor.
- E. With the exception of drainage structures having sumps, the bottom of the structures shall be channeled to provide for smooth flow through the manhole.
- F. Connections to manholes shall be properly supported and braced where not resting on original ground so that any settlement will not disturb the connection.

### 3.4 **STORM TREATMENT STRUCTURES**

- A. Materials shall be handled with care, inspected by the contractor upon delivery and shall be installed without causing damage to the product.
- B. Construction methods for treatment structures shall strictly conform to the manufacturer's recommendation, except where directed otherwise by the Owner's Representative.
- C. Structures shall be placed on a compacted layer of granular material as specified in the plan details or the manufacturer's recommendations. The structure subgrade shall be stable, compacted by the contractor if necessary.

- D. Connections and couplings to sewer pipe shall be of sufficient strength to prevent settlement, shifting, and to prevent trench soil from entering the pipe or the structure during or after installation.
- E. Final grade adjustment shall be included in the installation of treatment structures.

### 3.5 FINAL GRADE ADJUSTMENTS

- A. Final Grade – Existing Structures
  - 1. Adjustment of drainage structures shall apply to all final vertical changes made on existing structures where the elevation of the cover is not changed by more than eighteen (18) inches. Vertical changes in excess of eighteen (18) inches will be treated as structure reconstruction.
- B. Final Grade – New Structures
  - 1. Final grade adjustment of new structures shall be considered as incidental to the structure installation and/or construction.
- C. Final grade adjustments may be made using either brick and mortar construction or precast concrete adjustment rings at the option of the Contractor.
- D. The maximum allowable grade adjustment using grade rings shall be fifteen (15) inches. Final grade adjustment for manholes located in pavements and sidewalks shall be made with brick and mortar. A minimum of three (3) or maximum of six (6) courses of brick shall be placed on top of the precast cone section.

### 3.6 STUBS, CONNECTIONS, AND BULKHEADS

- A. The Contractor shall furnish all material and labor and shall install and/or construct stubs, connections, bulkheads, and related items of work as called for in the Contract Documents.
- B. Existing sewers shall be connected where called for on the drawings. Bulkheads shall be placed or removed where called for on the drawings.
- C. Unless otherwise noted on the drawings, stubs twelve (12) inches or larger in diameter shall consist of one full length of concrete storm sewer pipe, minimum length eight (8) feet, with watertight brick and mortar bulkhead. Unless otherwise noted on the drawings, stubs four (4) inches to ten (10) inches in diameter shall consist of one full length of plastic storm sewer pipe, minimum length of eight (8) feet, with an expandable plug or removable cap.

### 3.7 DRAINAGE STRUCTURE CONNECTION (TAPPING)

- A. Connections of drainage pipe and sewers to existing and new installed structures shall take care not to damage the structure. Contractor shall repair or replace structures damaged by tapping operations at no additional cost to the Owner.
- B. Voids in precast or pre-constructed tapping holes shall be filled with mortar around the pipe and struck smooth with the inner wall of the structure.
- C. Tapping an existing structure shall be performed to the outer diameter of the connecting pipe plus 6 inches. Mortar shall be used to fill the void around the pipe and strike smooth with the inner wall of the structure.

3.8 **CLEANING**

3.9 All sewers and structures shall be thoroughly cleaned of sediments and debris before final acceptance

3.10 **FIELD QUALITY CONTROL**

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  - 1. Submit separate reports for each system inspection.
  - 2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Damage: Crushed, broken, cracked, or otherwise damaged piping.
  - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  - 4. Reinspect and repeat procedure until results are satisfactory.
  
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

END OF SECTION 33 41 00